

A Guide to TracVision G4

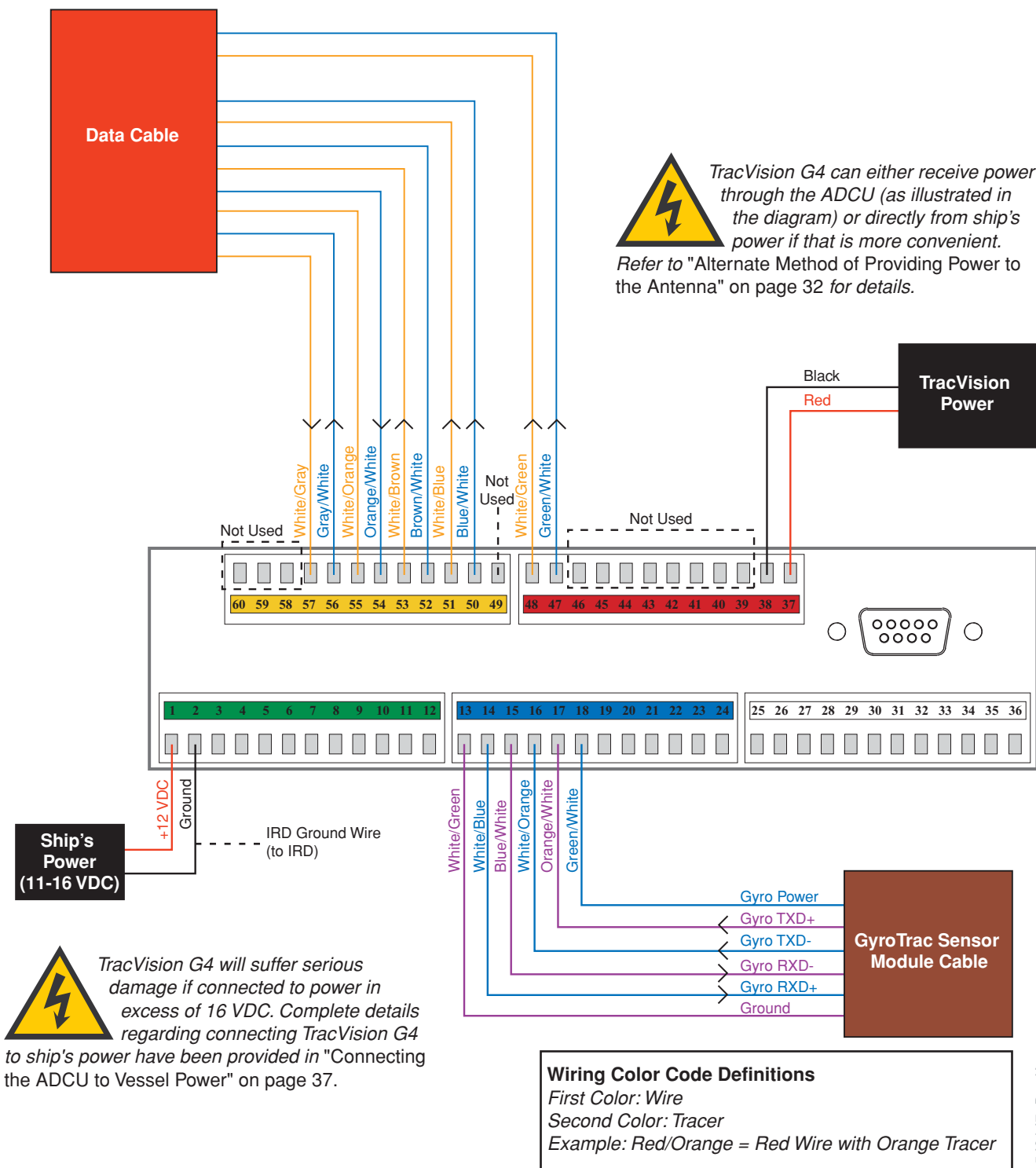
technical manual

- Installation
- Configuration
- Maintenance

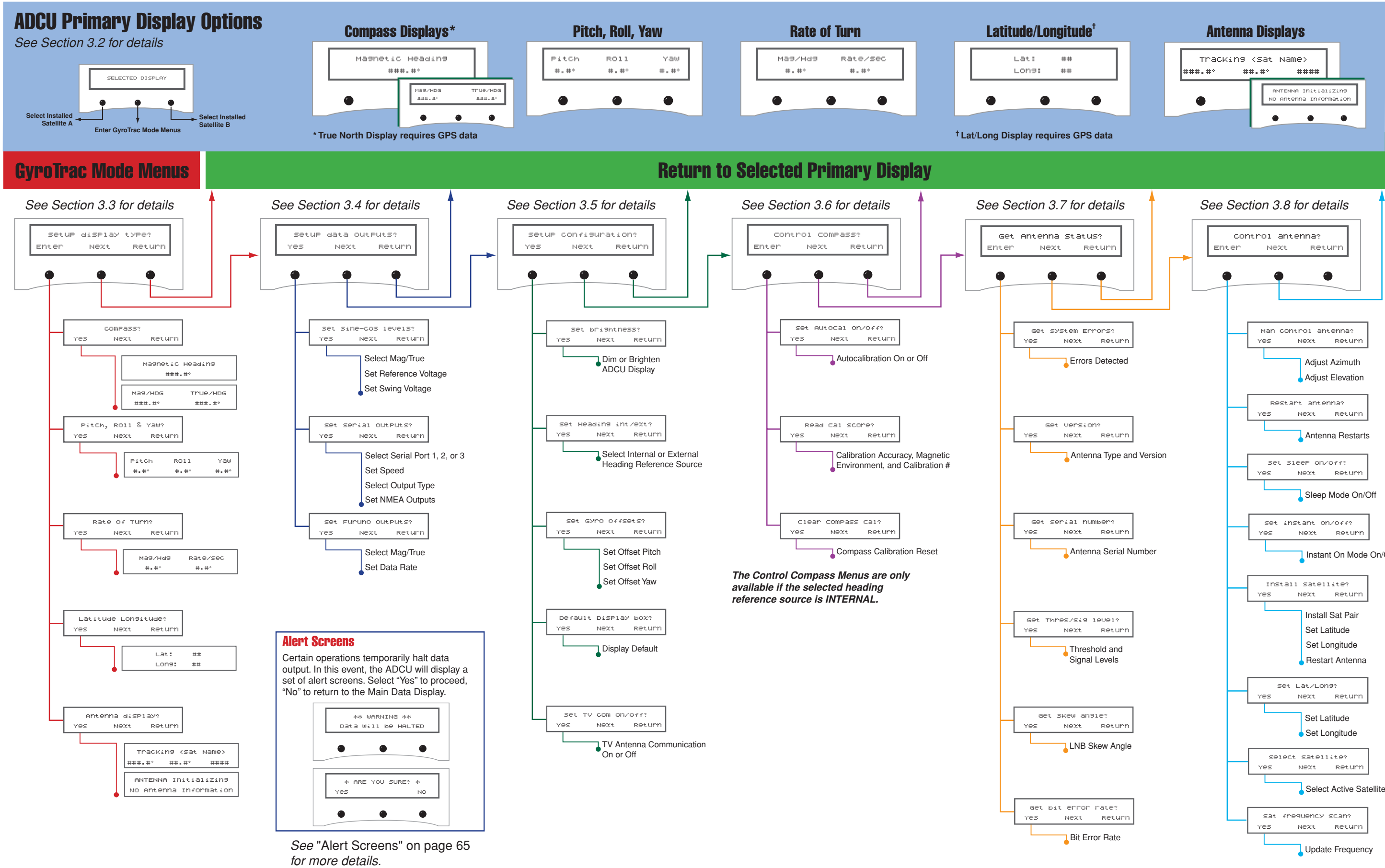


KVH TracVision® G4

TracVision® G4 Wiring Quick Reference Guide



GyroTrac™ Advanced Digital Control Unit (ADCU) Menu Quick Reference Guide



TracVision G4-HP

Technical Manual Addendum



(ECO #7622)

The following changes apply to Revision K of the TracVision G4-HP Technical Manual (KVH Part Number 54-0147).

5.3 TracVision G4 Field Replaceable Units

Table 5-1 has been updated to show the new part number for the RF PCB.

FRU	Part Number
Radome	02-0925-03
Main PCB	02-0992
RF PCB	02-1524
Antenna Gyro Sensor	02-1090
Antenna Gyro Gasket	24-0139
Elevation Drive Belt	24-0105-104
Elevation Motor	02-1356
North American LNB [†]	02-0870
European LNB ^{††}	02-1278
Data Cable	32-0619-50 [†] 32-0619-100 ^{††}
RF Cable	32-0417-50 [†]
PC Cable	32-0628-06
Power Cable	32-0510-50
Ground Cable	32-0583-50
CPU Fuses	16-0017-3150

Table 5-1

TracVision G4 Field Replaceable Units

[†] North American system

^{††} European system

TracVision G4-HP

Technical Manual Addendum

Sky Mexico Customers Only



(ECO #7247)

The following changes apply to Revision K of the TracVision G4-HP Technical Manual (KVH Part Number 54-0147).

Installed Satellites

The Sky Mexico satellite TV service is broadcast via the PAS 9 satellite located at 58° West longitude. Therefore, the Sky Mexico-configured antenna (KVH part number 01-0231-05HPT) is programmed to track the following satellites:

Satellite A	Satellite B
PAS_9	NONE

If you choose, you can install any other satellite from the antenna's satellite library as Satellite B (following the procedure in *Section 2.9, "Installing Satellites Using the ADCU" on page 44*). However, please note that the antenna may not be able to find your selected second satellite when you switch from PAS_9 to Satellite B, since the satellite may not be viewable from your location. *For example, in Mexico, you can receive Sky Mexico signals from PAS 9, but you cannot receive signals from DSS_101, which provides DIRECTV service to the U.S.*

Multiswitch Restrictions

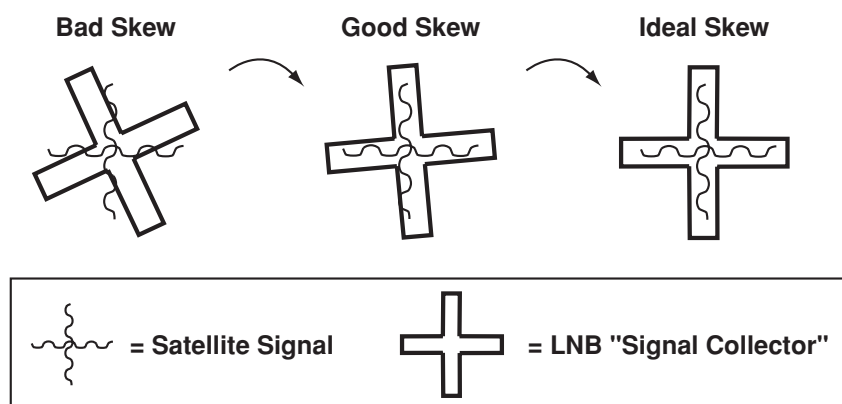
If you need to connect more than two receivers to the antenna system for PAS 9 service, you must use an **active multiswitch that generates a 22 KHz tone** (for example, Spaun models 5602NF or 5802NF).

LNB “Skew” Adjustment

Unlike most satellite TV signals in North America, which are circularly polarized, the PAS 9 signal is linearly polarized, which means it is transmitted in a certain orientation. Your Sky Mexico-configured antenna is equipped with a special LNB that collects these linear signals. To optimize reception, however, the LNB must be oriented in the same way as the satellite signal. This orientation adjustment is referred to as the LNB’s “skew.”

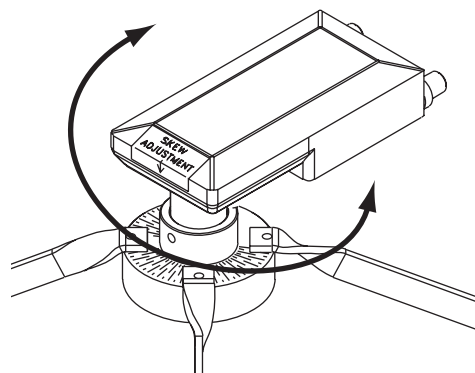
Figure 1 shows how skew determines the amount of signal the LNB collects. The more signal it collects, the better the reception.

Figure 1 *How Skew Works*



To set the skew, you simply need to rotate the LNB to the proper angle, as shown in Figure 2.

Figure 2 *LNB Can Be Rotated to Adjust Skew*



The correct skew setting varies depending on your geographic location, since the orientation of your antenna to the satellite changes as you move. Follow the instructions on the following pages to find the correct skew for your location and to adjust the LNB’s skew setting.

Finding the Correct Skew for Your Location

You can find the correct skew for your location by either:

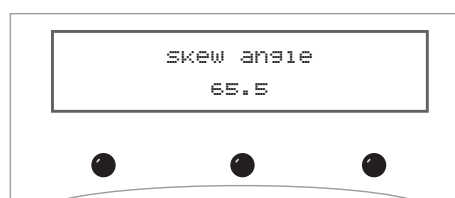
- A. Querying the antenna (by entering commands via a laptop connection), or
- B. Finding your location on the PAS 9 skew map.

Option A - Querying the Antenna

To find the correct skew, follow the steps below.

1. Turn on the antenna and allow the antenna to initialize.
2. Press the center button on the ADCU until the “Control Antenna?” screen appears.
3. Press the **ENTER** button to access the Control Antenna Mode.
4. Press the **NEXT** button until the “Set Lat/Long?” screen appears.
5. Follow the process shown in “*Setting Latitude and Longitude*” on page 86 to enter your position into the antenna.
6. After you’ve entered your position, press the **NEXT** button until the “Restart Antenna?” screen appears.
7. Press the **YES** button to restart the antenna.
8. Once the antenna has initialized, press the center button on the ADCU until the “Get Antenna Status?” screen appears.
9. Press the **ENTER** button to access the Antenna Status Mode.
10. Press the **NEXT** button until the “Get Skew Angle?” screen appears.
11. Press the **YES** button. The ADCU displays the correct skew for the location you entered in Step 5.

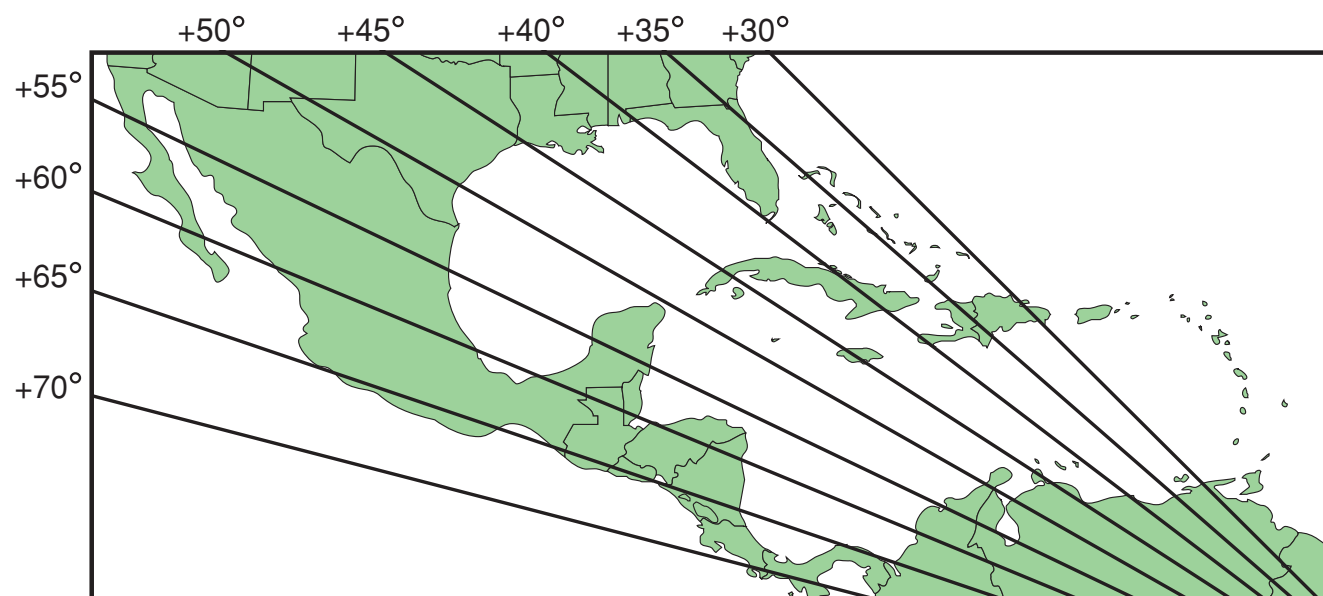
Figure 3 ADCU Reports Skew Angle (Example)



Option B - Using the PAS 9 Skew Map

If you do not have a laptop, you can find the approximate skew for your location using the map below.

Figure 4 *Approximate Skew Settings for PAS 9 Satellite*



When to Change the Skew

In general, if your LNB's skew is set to within $\pm 8^\circ$ of the ideal skew for your location, the antenna should continue to provide good satellite TV reception. However, if you travel to a location in which your LNB's skew differs by 9° or more, or if reception degrades the further you travel, you should readjust the LNB's skew for your new location.

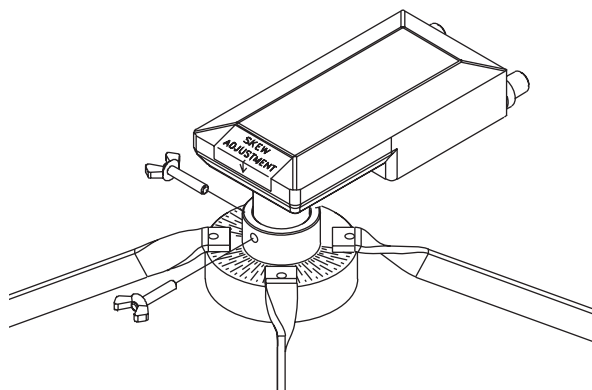
Example: If you traveled from El Salvador to Acapulco along the coast, you wouldn't need to change the skew, since the correct skew is 66° for both locations. Even if you continued traveling north to Cabo San Lucas, you should still have good satellite TV reception, since the correct skew is 63° , a 3° difference. However, if you traveled all the way to San Diego, where the correct skew is 54° , a 12° difference, you might then need to readjust the skew to enjoy satellite TV reception.

Setting the Skew

To set your LNB to the proper skew, follow the steps below.

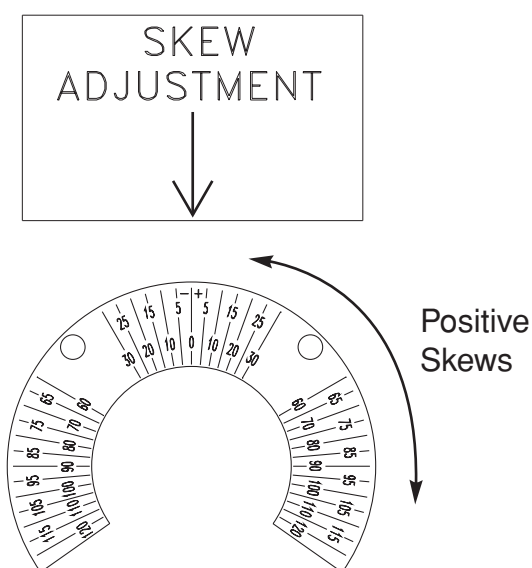
1. Turn off the power to the antenna.
2. Remove the radome and set it aside in a safe place.
3. Loosen the two wing screws securing the LNB within the choke feed, as shown in Figure 5.

Figure 5 LNB Skew Adjustment



4. Refer to the skew labels on the end of the LNB and on the LNB choke feed (shown in Figure 6) and adjust the LNB as necessary to match as closely as possible the correct skew.

Figure 6 Skew Labels



Skews for PAS 9 are all positive (+) angles. Do not set the skew to a negative number.

5. Retighten the wing screws.
6. Reinstall the radome.

TracVision G4-HP

Technical Manual Addendum



(ECO #7243)

The following changes apply to Revision K of the TracVision G4-HP Technical Manual (KVH Part Number 54-0147).

“Instant On” Mode Default Setting Is OFF

The default setting for Instant On Mode is now **OFF**, not **ON**.

When Instant On is set to **ON**, the antenna skips the startup process to immediately receive the TV signal, as long as the vessel has not moved since the antenna was last shut off. See *Section 3.8, “Control Antenna Mode”* for details.

Antenna Restarts After =CALGYRO Command

When the antenna receives an **=CALGYRO** command, it calibrates the gyro *then restarts*. This eliminates the need to enter a **ZAP** command following the calibration process.

If you need to calibrate the gyro, follow the updated procedure below. This procedure replaces the “Calibrating the Antenna Gyro” instructions in *Section 5.6, “Replacing the Antenna Gyro Assembly.”*

1. With a PC connected to the ADCU’s maintenance port, apply power to the antenna unit.
2. Type **HALT<cr>** (<cr> = Press the ENTER key) while the system is performing the limit switch initialization routine.
3. Type **DEBUGON<cr>** to enter Debug mode.
4. Type **=LSTEST<cr>**.
5. Type **EL,300<cr>**.
6. Type **=CALGYRO<cr>**. Verify that the Antenna Gyro Azimuth scale factor is between -0.00090 and -0.00110 and the Antenna Gyro Elevation scale factor is between 0.00090 and 0.00110.

The antenna restarts. *The gyro calibration process is complete!*



If your vessel is moored in calm waters, you might be able to turn on your receiver while leaving the antenna turned off. As long as the vessel has not moved since you last turned off the antenna, you might still get good TV reception. However, once the vessel moves and reception is lost, you will then need to turn the antenna back on to reacquire the satellite and resume active tracking.



Refer to Section 4.6, “Computer Diagnostics” for details on connecting a PC to the maintenance port.

TracVision G4-HP

Technical Manual Addendum



(ECO #7134)

The following changes apply to Revision K of the TracVision G4-HP Technical Manual (KVH Part Number 54-0147).

*The “=TV” configuration command printed in the manual is incorrect. For your TracVision G4-HP system, the correct configuration command is **=TVG4HPT**, not **=TVG4HP**.*

*You will need to enter the **=TVG4HPT** command whenever you replace the main printed circuit board (PCB) or calibrate the antenna gyro, at the steps noted below.*

5.4 Replacing the Main PCB and Fuses

Replacing the Main PCB

13. Type **=TVG4HPT<cr>** (<cr> = Press the Enter key).

5.6 Replacing the Antenna Gyro Assembly

Calibrating the Antenna Gyro

8. Type **=TVG4HPT<cr>**.

TracVision G4

Technical Manual

This manual provides detailed instructions on the proper installation, configuration, troubleshooting, and maintenance of the KVH TracVision G4 system. Complete instructions on how to use the TracVision G4 system is provided in the *TracVision G4 User's Guide*.

Throughout this manual, important information is marked for your attention by these icons:



A helpful tip that either directs you to a related area within the manual or offers suggestions on getting the best performance from your system.



An alert to important information regarding procedures, product specifications, or product use.



Information about installation, maintenance, troubleshooting, or other mechanical issues.



An electrical safety warning to help identify electrical issues that can be a hazard to either this KVH product or a user.



TracVision G4 Serial Number



This serial number will be required for all troubleshooting or service calls made regarding this product.

Direct questions, comments, or suggestions to:

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[Click here to go to our state-of-the-art Customer Support web page...the fastest and easiest way to get all of your questions answered!](#)

If you have any comments regarding this manual, please e-mail them to manuals@kvh.com. Your input is greatly appreciated!



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1 — Introduction

This section provides a basic overview of the TracVision G4 system. It explains how the system works and describes the function of each component.

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1.1 TracVision G4 System Overview

A complete satellite TV system, illustrated in Figure 1-1, includes the TracVision G4 antenna unit connected to the GyroTrac digital gyro-stabilized sensor, Advanced Digital Control Unit (ADCU), an IRD (satellite TV receiver), and a television set. A desktop or laptop computer is used to conduct diagnostics. *System specifications are provided in Appendix A on page 123.*

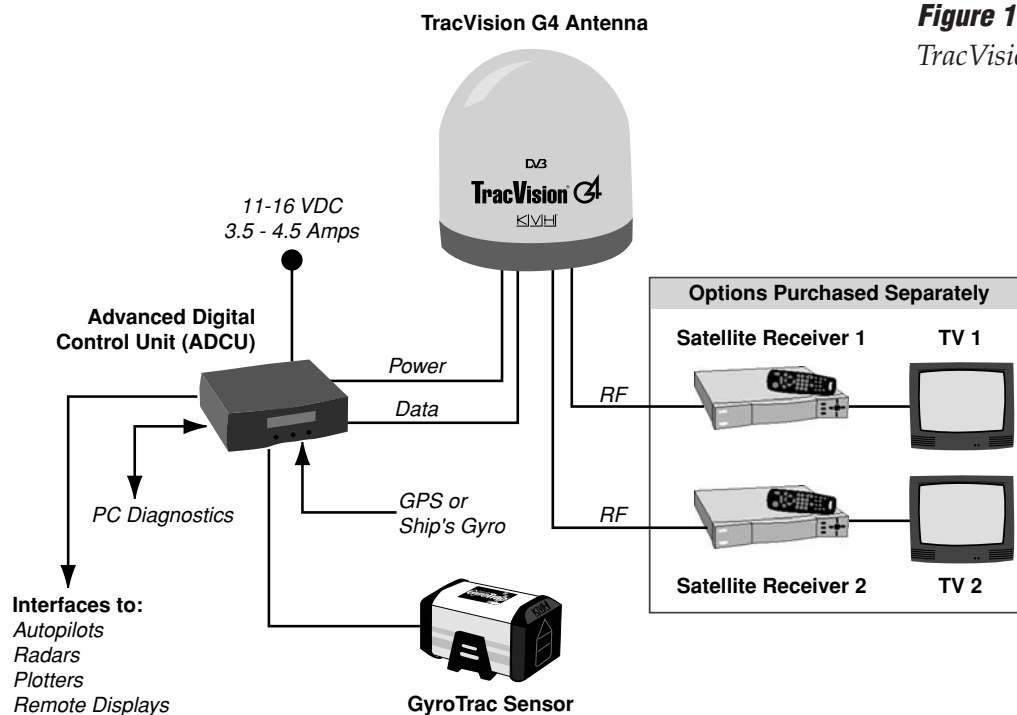


Figure 1-1

TracVision G4 System Diagram

System Compatibility

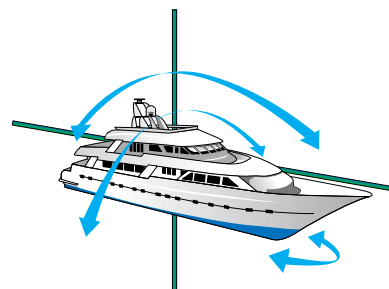
The TracVision G4 satellite antenna is fully compatible with Digital Video Broadcasting (DVB®) satellites, as well as DIRECTV®'s Digital Satellite Service (DSS) satellites. The system is also fully compatible with KVVH's TracNet™ 2.0 Mobile High-speed Internet System (for more information about TracNet 2.0, please visit our web site at www.kvh.com).

In-motion Tracking

The TracVision G4 uses a state-of-the-art actively stabilized antenna system. Once the satellite is acquired, the antenna gyro continuously measures the heading, pitch, and roll of your vessel and sends commands to the antenna motors to keep the antenna pointed at the satellite at all times.

Figure 1-2

TracVision Identifies and Compensates for Vessel Motion





TracVision G4's default satellite pairs are:

N. America (US DIRECTV):
DSS_101 & DSS_119

Europe: Astra 1 & Hotbird

Satellite Library

Your TracVision G4 includes a pre-programmed satellite library of North American and European satellite services. When configuring the TracVision G4, you may choose a pair of satellites from the library to be active in the system and with your IRD.

For the antenna to track and receive signals from two satellites, they must be within 10° longitude of each other in orbit. As a result, certain satellites can be paired only with certain other satellites. Tables 1-1 and 1-2 list the possible satellite pairs that may be selected in North America and Europe. *If the satellite service you wish to receive is not listed in the satellite library, you may add two additional satellites of your choice to the library.*

Table 1-1

Available Satellite Pairs

- North America

(North American LNB required)

	DSS_101	DSS_119	Echo_61	Echo_110	Echo_119	Echo_148	Expressvu	ExpressTV
DSS_101		✓					✓	✓
DSS_119	✓						✓	✓
Echo_61				✓	✓		✓	✓
Echo_110			✓		✓	✓	✓	✓
Echo_119			✓	✓		✓	✓	✓
Echo_148				✓	✓		✓	✓
Expressvu	✓	✓	✓	✓	✓	✓		✓
ExpressTV	✓	✓	✓	✓	✓	✓	✓	

Table 1-2

Available Satellite Pairs - Europe

(European LNB required)

	Astra 1	Astra 2N	Astra 2S	Hispasat	Hotbird	Sirius	Thor
Astra 1		✓	✓		✓	✓	
Astra 2N	✓				✓		
Astra 2S	✓				✓		
Hispasat							
Hotbird	✓	✓	✓			✓	
Sirius	✓				✓		✓
Thor						✓	

1.2 TracVision G4 Components

Your TracVision G4 system includes the following components:

Antenna Unit

The antenna unit houses the antenna positioning mechanism, low noise block (LNB), power supply, and control elements within a molded ABS radome. Weathertight connectors on the bottom of the baseplate join the power, signal, and control cabling from belowdecks units.



GyroTrac

TracVision G4 includes KVVH's GyroTrac digital gyrocompass for three-axis attitude/heading reference, ensuring superior open water performance in any sea conditions. GyroTrac can also operate as a fully functional, stand-alone heading sensor.

GyroTrac includes the following two components:

Sensor Module

The sensor module houses the system's compass/yaw sensor, inclinometer, rate gyros, and processing electronics and is waterproof to a depth of one meter.



Advanced Digital Control Unit (ADCU)

The ADCU is the user interface, providing access to the system and its functions through an LCD and three soft keys. The ADCU also serves as the system's junction box, allowing the system to use ship's power, interface with the sensor module, supply and receive data to/from the TracVision G4 system, and supply and receive data to/from other shipboard systems.



Integrated Receiver Decoder (IRD) (Satellite TV Receiver)

The IRD (purchased separately) receives satellite signals from the antenna unit for signal processing and channel selection, and sends the signals to the TV set for viewing. Please refer to the user's manual provided with your selected IRD for complete operating instructions.



Before you can start watching satellite TV using your TracVision antenna, you will need to activate your IRD. Refer to Section 2.8, "Activating/Programming the IRD" on page 42 for details.

1.3 Materials Provided With the TracVision G4

Table 1-3 lists the components and materials in the TracVision G4 shipping carton.

Table 1-3
TracVision G4 Packing List



For lists of items supplied in the kitpacks, see Tables 2-3 and 2-4 on page 10.

Component	KVH Part No.
Antenna Unit	02-0989-01HP [†] 02-0989-02HP ^{††}
Installation Kitpack	72-0099
Data Cable	32-0619-50 [†] 32-0619-100 ^{††}
PC Cable	32-0628-06
RF Cable*	32-0417-50
Power Cable	32-0510-50
Ground Cable	32-0583-50
<i>TracVision G4 Technical Manual</i>	54-0147
<i>TracVision G4 User's Guide</i>	54-0147-01
GyroTrac, which includes:	01-0226-01
<i>Sensor Module</i>	<i>02-1154</i>
<i>ADCU</i>	<i>02-0961</i>
<i>Flush Mount ADCU Panel</i>	<i>20-0667</i>
<i>Horizontal Sensor Bracket</i>	<i>20-0658</i>
<i>Vertical Sensor Bracket</i>	<i>20-0666</i>
<i>Sensor to ADCU Cable</i>	<i>32-0623-30</i>
<i>Kitpack</i>	<i>72-0095</i>

[†] North American system

^{††} European system

* Not included with European systems

2 — Installation

This section explains how to install, configure, and test the TracVision G4 system. Follow the simple procedures in this section sequentially to ensure a safe and effective installation.

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2.1 Planning the Installation

Who Should Install the TracVision G4

KVH recommends that a KVH-authorized technician install the TracVision G4 system. Installers should have experience installing electronic equipment on a vessel.

Materials and Equipment Required for Installation

Before you begin installing the TracVision G4 system, you need to verify that you have all of the following tools and materials:

- Electric drill
- $\frac{3}{8}$ " (10 mm) drill bit and 3" (80 mm) hole saw
- Socket wrenches
- $\frac{7}{16}$ " open end wrench
- Flat head and Phillips screwdrivers
- Crimp tool (Augat T1000 or equivalent)
- Light hammer; center punch; tape; scribe/pencil
- Terminal lug crimping tool; wire strippers
- A PC with terminal emulation software such as Windows Hyperterminal or PROCOMM.
- RG-6 or RG-11 cable with F-type connectors for extra RF signal cables as needed. *Refer to Table 2-1 to determine the number of RF cables that you will need.*

Connecting to:	# RF Cables
North American Systems	
One IRD	1
Two or more IRDs	2*
European Systems	
One IRD	1
Two IRDs	2

* Multiswitch needed for three or more IRDs. Follow multiswitch manufacturer's guidelines.



Plan the entire installation before proceeding! Take into account antenna unit placement, cable running distances between units, and accessibility to the equipment after installation.



RG-11 or RG-6 cable with F-type connectors is required for all RF wiring. Use of any other cable will result in degraded performance. Use RG-6 cable for distances up to 75 ft (23 m); use RG-11 cable for distances greater than 75 ft (23 m). The KVH warranty does not cover degraded performance due to improper wiring.

Table 2-1

Number of RF Cables to Connect to the Antenna



You may want to connect two RF cables to the antenna in all cases. That way, if an IRD is added in the future, no additional RF cables will need to be run.

- Power cable to connect the ADCU to ship's power (Table 2-2 provides proper gauge and length specifications).

Table 2-2

*Recommended ADCU-to-Ship's
Power Cable Specifications*

Cable Length	Cable Gauge
to 50 ft (15 m)	14 AWG (1.5 mm ²)
+50 ft (+15 m)	12 AWG (2.5 mm ²)

Kitpack Contents

The kitpacks packaged with your antenna unit and GyroTrac contain various hardware and other materials that will be needed to complete the TracVision system installation. Ensure that the kitpacks contain all of the items listed in Tables 2-3 and 2-4.

Table 2-3

Antenna Unit Kitpack Contents

Part	Qty.
¼"-20 x 3" hex head screws	4
¼" flat washers	8
¼"-20 self-locking nuts	4
Plastic screw covers	6
Foam seal	1
Tie-wraps	2
Core clamp (ferrite)	1

Table 2-4

GyroTrac Kitpack Contents

Part	Qty.
#8 fiber washers	10
#8 flat washers	10
#8-32 self-locking nuts	5
#10 flat washers	5
#10 lock washers	5
#10-32 Phillips head screws	5
#8 Phillips head screws	5
#8-32 Phillips head screws	5
#8 lock washers	5
#8 Phillips head (black) screws	5
Velcro self-adhesive backings	4
Velcro washers	4
4" tie-wraps	5

Part	Qty.
Tie-wrap screw mount	6
Terminal strip connectors	5
Sensor module to ADCU power wire ferrite	1
#4-24 thread-forming screws	4

Table 2-4

*GyroTrac Kitpack Contents
(Continued)*

Choosing Component Locations

The major considerations in locating the TracVision components are described below.

Cable Lengths

When determining component locations, keep in mind accessibility and cable lengths between units. Lengths of these cables are as follows:

Cable (Function)	Length
Data Cable (ADCU to Antenna Unit)	50 ft (15 m) [†] 100 ft (30 m) ^{††}
PC Cable (ADCU to PC)	6 ft (2 m)
RF Cable (Antenna to IRD)*	50 ft (15 m) [†]
Power Cable (Power to Antenna Unit)	50 ft (15 m)
Sensor to ADCU Cable (GyroTrac)	30 ft (10 m)
IRD Ground to ADCU Ground Cable	50 ft (15 m)

[†] North American system

^{††} European system

* Not included with European systems

Table 2-5

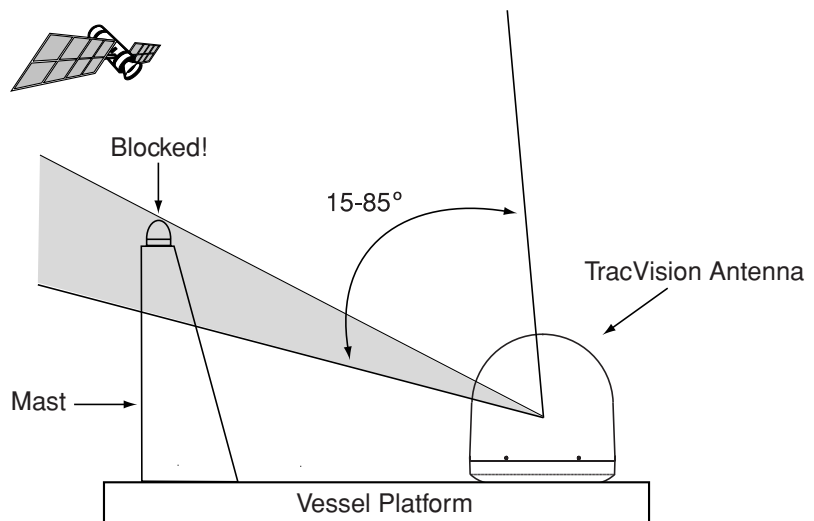
*Lengths of Provided
Belowdecks Cables*

Choosing the Best Location for the TracVision Antenna

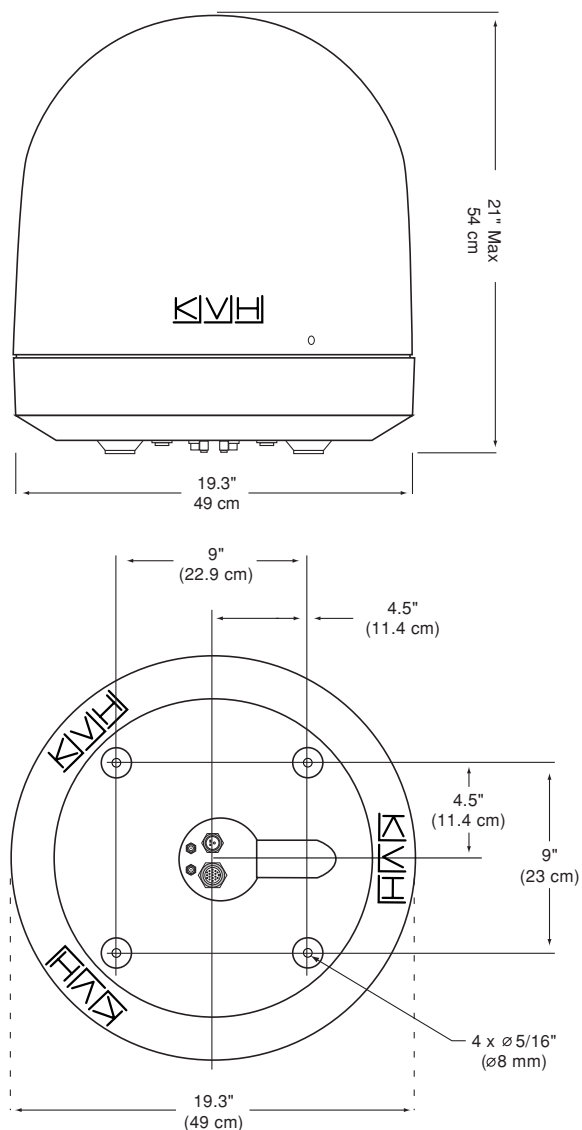
There are several factors to consider when choosing the location for the TracVision antenna.

- Since the TracVision antenna requires a clear view of the southern sky to receive satellite signals, the ideal antenna site has an unobstructed view of the horizon/satellite all around. The less blockage, the better the system performs.
- Keep the antenna clear of any obstructions above decks. The antenna requires a 15° to 85° look angle to receive satellite signals.

Figure 2-1
Antenna Blockage



- To minimize tracking errors, place the antenna unit as close as possible to the intersection of the vessel's fore-and-aft centerline and midships.
- The mounting surface should be flat and strong enough to carry the complete assembly (30 lbs/ 13.6 kg). To prevent warpage to the antenna baseplate, make sure that the mounting surface is rigid so that it cannot flex when the vessel vibrates. If necessary, add a strength member to the mounting site to stiffen it.
- Be sure to account for the height and base dimensions (see Figure 2-2 on the following page).

**Figure 2-2***Antenna Unit Dimensions*

The radome exterior is treated with a special finish selected for compatibility with the dome material and transparency to the satellite signals. Application of additional paints or finishes WILL degrade performance, potentially beyond acceptable limits.



A full-size template of the baseplate mounting holes has been provided in Appendix B on page 127.

Radar Concerns

The TracVision antenna must be kept out of line with nearby radars, as their energy levels may overload the antenna's front-end circuits. In an ideal installation, the antenna is mounted four feet (1.2 m) above and four feet (1.2 m) away from the radar (measured from the center of the antenna dome to the center of the radar).

The best placement for the TracVision antenna is above the radar. However, if there will be a significant horizontal separation between the radar and TV dome (i.e., at least 8 to 10 feet (2.5 to 3 m)), the TracVision antenna can be placed below the radar as there will be little chance of signal blockage.



If uncertain of the best location for the sensor module, make a temporary installation and conduct a calibration (as described in Section 2.7, “Calibrating the Sensor” on page 40). Any necessary adjustments to the sensor location can be made based on the calibration scores.

Choosing the Best Location for the GyroTrac Sensor

- Ideally, the sensor module should be mounted as low as possible in the center of the vessel – but NOT in the bilge.
- The mounting surface should be free of excessive vibration and flexing.
- Maintain at least four feet (1.3 m) separation between the sensor module and any magnetized materials, large ferrous masses, cranes, engines, derricks, other antennas, cables carrying high amperage direct current, or battery banks.
- Take extra care when mounting the sensor module on a steel vessel. Enclose the sensor module in a fiberglass container and use an aluminum, brass, plastic, or wood (NOT steel or iron) platform to position the sensor at least four feet (1.2 m) above and six feet (1.8 m) away from the steel surface.
- Be alert for devices that change their magnetic characteristics when in use, such as CRTs (computer and TV screens), radar magnetrons, electric winches, loudspeakers, windshield wipers, and other devices with DC motors. GyroTrac cannot compensate for changing magnetic fields created by these devices.
- If you need to fabricate custom mounting brackets for the sensor module, they should be made from non-ferrous materials such as wood, brass, aluminum, fiberglass, or plastic. Be sure to use stainless steel bolts or nails.

Choosing the Best Location for the ADCU

- The ADCU should be mounted in a dry location, allowing enough room at the back for connecting system cables.
- The ADCU should be placed so that the LCD display is visible and the buttons are accessible.
- The ADCU is not susceptible to magnetic interference and does not need to be mounted on a level surface.

2.2 Mounting the TracVision Antenna

1. Make sure that you have chosen a suitable mounting location based upon the guidelines in *“Choosing the Best Location for the TracVision Antenna”* on page 12.
2. Using the template provided in *Appendix B* on page 127 or the dimensions shown in Figure 2-3, lay out the four mounting bolt holes and cable access hole at the mounting site. Make certain that the “FWD” arrow is parallel with the vessel’s centerline and pointed toward the bow.

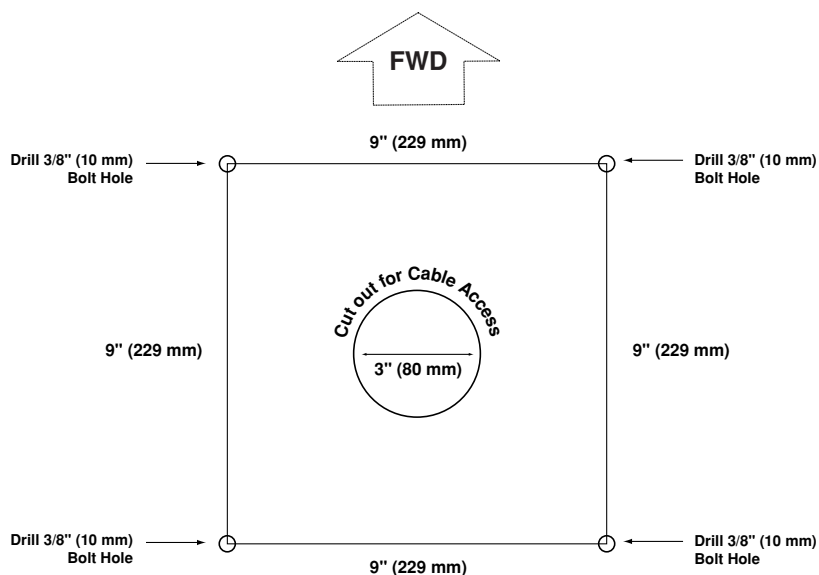


Figure 2-3

Antenna Mounting Holes Layout

3. Drill the four $\frac{3}{8}$ " (10 mm) bolt holes and cut out the 3" (80 mm) diameter cable access hole (following the layout in Step 2). Smooth the edges of the cable access hole to protect the cables.
4. Bring the data cable, power cable, and RF cable(s) from belowdecks up through the cable access hole in the mounting surface (see Table 2-1 on page 9 to determine the number of RF cables required).
5. Remove the antenna unit from its shipping carton.



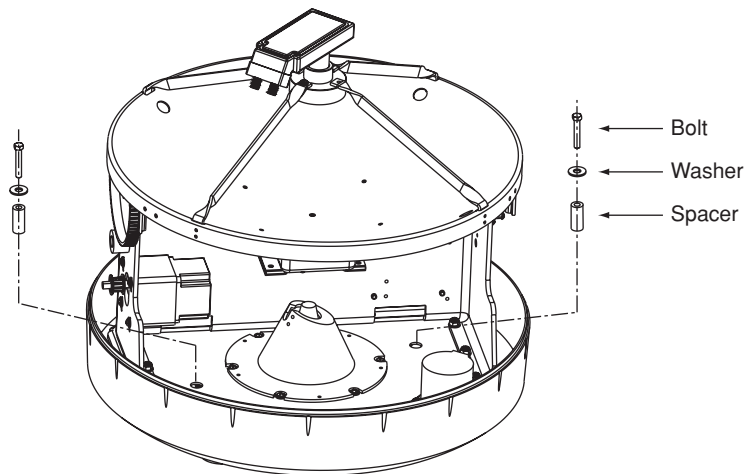
Always lift the antenna unit by the gray baseplate and never by the radome or any portion of the antenna assembly. Also be careful not to strike the exposed connectors extending from the bottom of the baseplate or allow them to carry the weight of the antenna unit.

6. Remove and save the three screws securing the radome to the baseplate. Carefully lift the radome straight up until clear of the antenna assembly and set it aside in a safe place. If you bring the radome topside, be sure to secure it with a lanyard so that it does not fall overboard.
7. Remove the foam shipping restraint from the antenna unit.
8. Using a 10 mm wrench, remove the two azimuth shipping restraint bolts, washers, and spacers from the antenna unit, as shown in Figure 2-4.

Figure 2-4
Azimuth Shipping
Restraint Removal

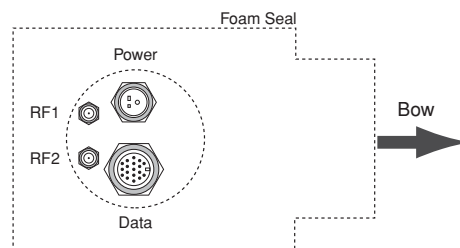


The shipping restraints must be removed before power is applied. Save the restraints for reuse and be sure to install them whenever the antenna unit is moved from place to place. See Section 5.10, "Preparing for Shipment" on page 118 for instructions on preparing for shipment.



9. Place the foam seal in position on the mounting surface with the hole centered over the cable access cutout. Do not remove the paper backing at this time. Align the seal with the vessel's centerline and the narrow end pointing toward the bow (see Figure 2-5). Scribe a line all around the seal.

Figure 2-5
Baseplate/Foam Seal Orientation
(Bottom View)

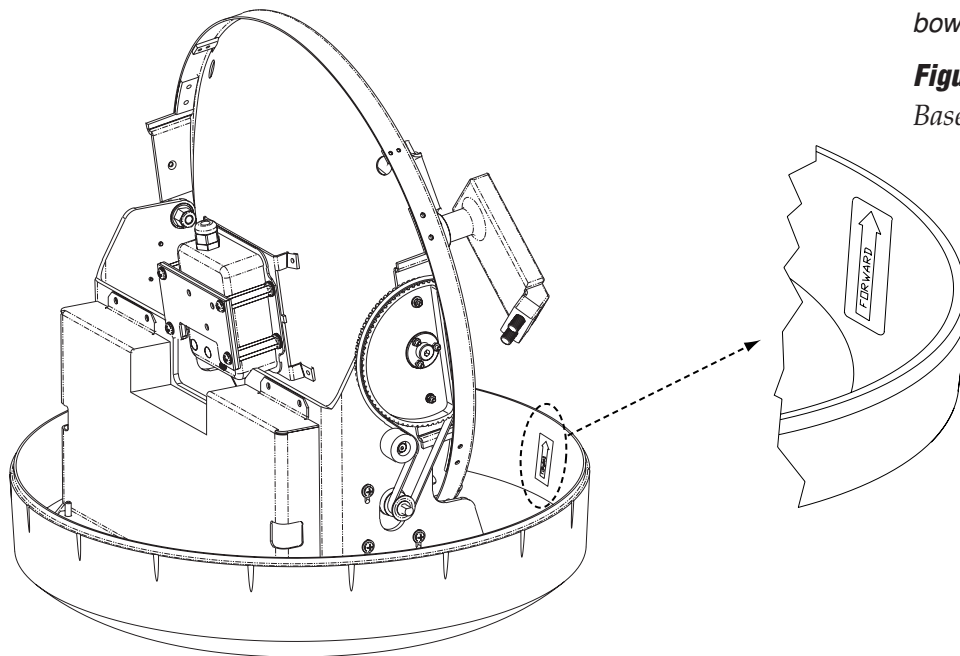


10. Position the baseplate assembly in place over the mounting holes and cable access, with the baseplate's "Forward" arrow (shown in Figure 2-6) pointing toward the bow. Ensure that all holes line up and that the connectors are centered over the cable access. Make any necessary adjustments before seating the foam seal in place permanently.



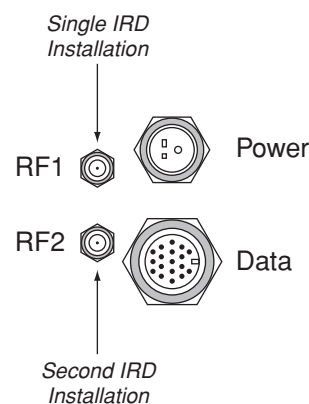
*For the antenna to work properly, the baseplate's "Forward" arrow **MUST** be parallel with the vessel's centerline and pointed toward the bow.*

Figure 2-6
Baseplate "Forward" Arrow



11. Clean the mounting surface where the foam seal will be placed. Remove the paper backing from the foam seal to expose the contact cement, then lay the foam seal in place, adhesive side down, and press down firmly to bring the adhesive into full contact along the mounting surface. **Ensure the narrow end points toward the bow.**
12. Connect the data, power, and RF cables from belowdecks to the baseplate as shown in Figure 2-7. Turn the power and data cable connectors down until locked in place; don't use excessive force. Connect the RF cable(s) using a $\frac{7}{16}$ " wrench, applying 30 pounds of torque. If you connect more than one RF cable, label both ends of each RF cable to match its antenna baseplate connector (RF1 or RF2). **Do NOT use teflon gel on the cable fittings as it reduces signal strength at higher frequencies.**

Figure 2-7
Baseplate Connector Assignments
(Bottom View)

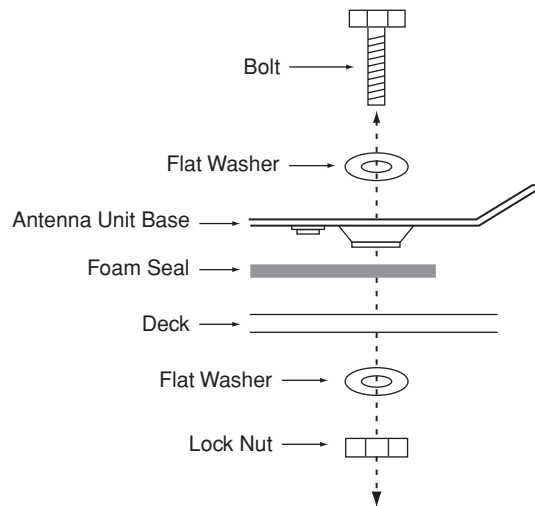




When rotating the azimuth mechanism by hand, go slowly. Hitting the mechanical stops with excessive force will damage the azimuth limit switch.

Figure 2-8

Bolting the Antenna Unit to the Deck (Side View)



13. Place the antenna baseplate over the holes drilled in the foundation, ensuring the "Forward" label (shown in Figure 2-6) points toward the bow.
14. At each of the four baseplate mounting holes, place a $\frac{1}{4}$ " flat washer on a $\frac{1}{4}$ "-20 bolt and insert the bolt into the hole from above, as shown in Figure 2-8. Carefully rotate the azimuth mechanism plate to expose all four mounting holes.

15. Apply a $\frac{1}{4}$ " flat washer and $\frac{1}{4}$ "-20 lock nut from below, as shown in Figure 2-8.
16. Tighten securely (but do not overtighten) until the foam seal is compressed as far as it will go and all four feet are bottomed against the mounting surface.
17. *If you are installing a European system:*
Leave the radome off for now; you will install it later.

If you are installing a North American system:
Place the radome over the baseplate. Align the three radome screw holes with the baseplate nut holders, insert the #10-24 screws and tighten. Install a protective plastic screw cap from the kitpack over each screw.

2.3 Mounting the GyroTrac Sensor

GyroTrac comes with the following two mounting brackets:

Horizontal Sensor Bracket

Attaches directly to the sensor module housing
and must be used in all mounting arrangements

Vertical Sensor Bracket

For mounting the sensor to a vertical surface

These two brackets should enable you to place the sensor module as level as possible. If you are unable to place the sensor module in a level arrangement, refer to “Entering Gyro Offset Values” on page 75 to compensate for the offset.

To mount the GyroTrac sensor, choose either of the following options:

Option 1 - Mounting the Sensor to a Horizontal Surface

Option 2 - Mounting the Sensor to a Vertical Surface

The following sections describe how to mount the sensor for both of these options.

Figure 2-9

Horizontal Sensor Bracket

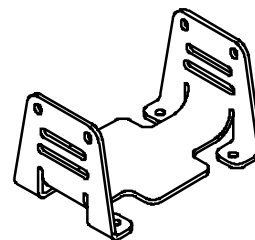
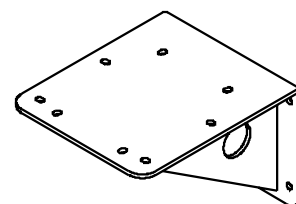


Figure 2-10

Vertical Sensor Bracket

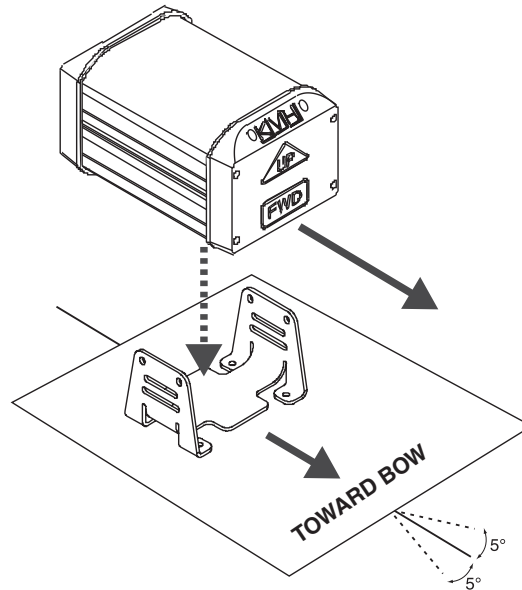


Be sure to follow the guidelines in “Choosing the Best Location for the GyroTrac Sensor” on page 14.

Option 1 - Mounting the Sensor to a Horizontal Surface

1. Choose a mounting location based upon the guidelines in “Choosing the Best Location for the GyroTrac Sensor” on page 14.
2. Orient the sensor so that the forward reference on the end cap is pointed forward and is parallel to the vessel’s fore-and-aft axis (to $\pm 5^\circ$). The proper orientation is illustrated in Figure 2-11.

Figure 2-11
*Proper Orientation of
the Sensor Module*



3. Position the horizontal sensor bracket so that the sensor module will be properly oriented when placed in the bracket.
4. Using the holes in the bracket feet as a template, mark locations for the four mounting screws. Center punch and drill the four holes with a $\frac{1}{8}$ " (3.5 mm) bit. Reposition the bracket over the mounting holes.

5. Insert #8 fiber washers into the mounting bracket's four mounting holes on both sides of the mounting bracket (see Figure 2-12).

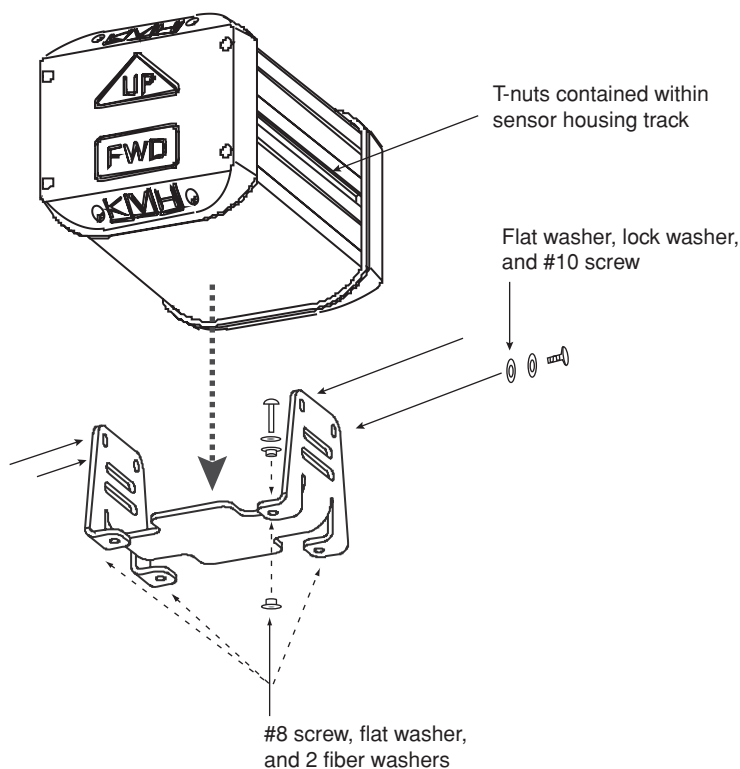


Figure 2-12

Securing the Sensor Module and the Horizontal Sensor Bracket

6. Insert #8 flat washers and #8 Phillips screws into the mounting bracket's four mounting holes from above. Secure the bracket to the mounting surface.
7. Place the sensor module in the bracket with the proper orientation (up/forward).
8. Thread #10-32 screws through lock washers, flat washers, and bracket, and then into the captive extrusion T-nuts within the sensor module housing, as shown in Figure 2-12.

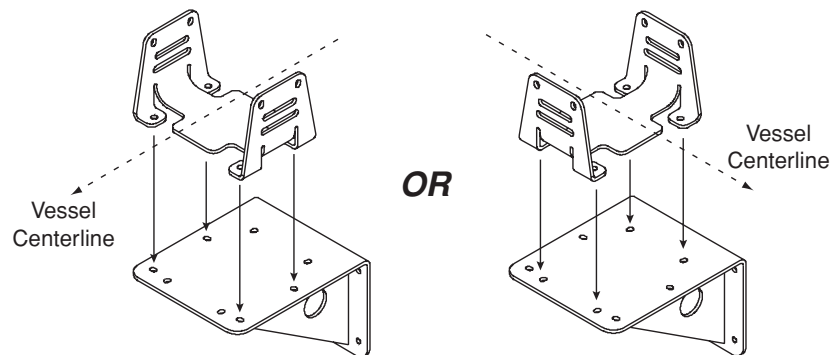


Should you ever need to replace the #10-32 screws used to secure the housing to the bracket, the screws must be no longer than $\frac{3}{8}$ " (10 mm) to avoid damaging the housing.

Option 2 - Mounting the Sensor to a Vertical Surface

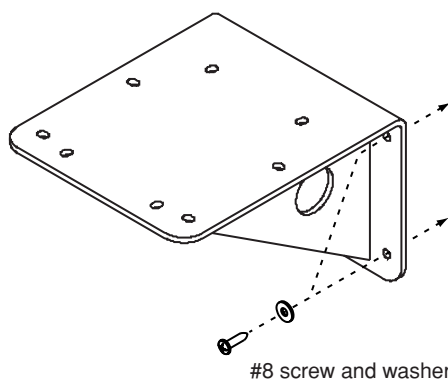
1. Choose a mounting location based upon the guidelines in *“Choosing the Best Location for the GyroTrac Sensor”* on page 14.
2. The module must be oriented so that the forward reference on the end cap is pointed forward and parallel to the vessel’s fore-and-aft axis (see Figure 2-11 on page 20). The brackets are designed so that the sensor module may be mounted perpendicular or parallel to the mounting surface, as pictured in Figure 2-13.

Figure 2-13
Bracket Orientations

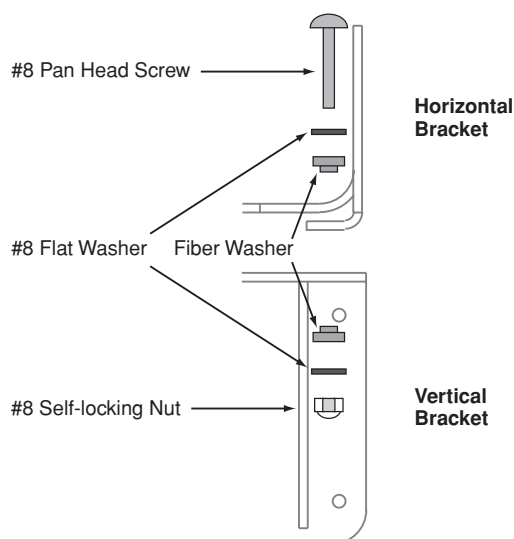


3. The module must be level with the vessel’s deck. You may fine-tune this placement using the ADCU’s pitch and roll data. Adjust the brackets so that the pitch and roll are 0 (zero) when the vessel is docked and under normal load.
4. When choosing a location for the unit, make certain that there is sufficient overhead clearance for both brackets *and* the sensor module.
5. Using the holes in the vertical sensor bracket as a template, mark locations for the four mounting screws. Center punch and drill the four holes with a $\frac{1}{8}$ " (3.5 mm) bit.

6. Secure the vertical sensor bracket to the mounting surface with #8 Phillips screws and flat washers (see Figure 2-14).



7. Position the horizontal sensor bracket over the mounting holes in the vertical sensor bracket, as shown in Figure 2-13.
8. Insert fiber washers into both sides of the mounting brackets, as shown in Figure 2-15.



9. Insert #8 flat washers and #8-32 Phillips screws into the horizontal bracket's mounting holes from above and through the vertical bracket. Secure in place with #8 self-locking nuts and flat washers.
10. Place the sensor module in the horizontal bracket with the proper orientation (up/forward).
11. Thread #10-32 machine screws through lock washers, flat washers, and bracket, and then into the captive extrusion T-nuts within the sensor module housing, as shown in Figure 2-12.



If you do not use the supplied #8 screws, be sure to use equivalent hardware that ensures secure mounting and minimum vibration.

Figure 2-14
Mounting the Vertical Sensor Bracket

Figure 2-15
Securing the Horizontal Bracket to the Vertical Bracket



Should you ever need to replace the #10-32 screws used to secure the housing to the bracket, the screws must be no longer than $\frac{3}{8}$ " (10 mm) to avoid damaging the housing.

2.4 Mounting the ADCU

Mount the ADCU using either of the following options:

Option 1 - Velcro Fastening on a Horizontal Surface

Option 2 - Flush-mounting

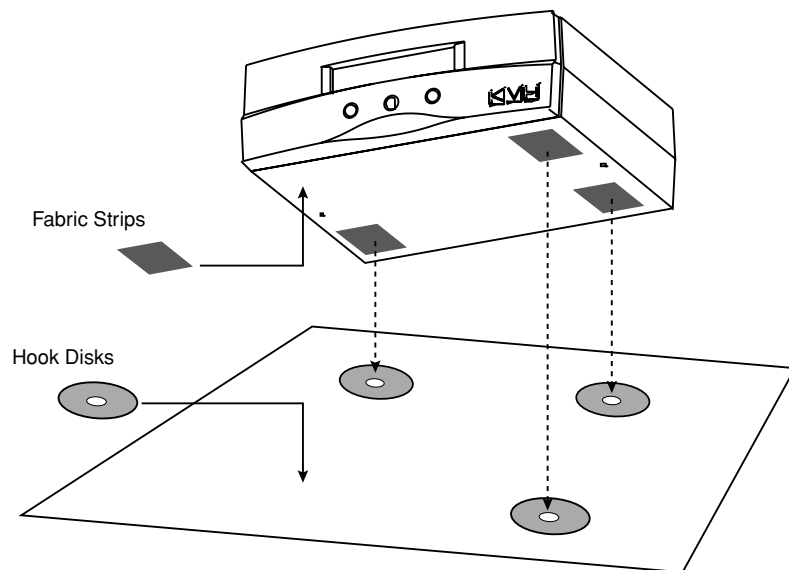
The following sections describe how to mount the sensor for both of these options.



When choosing a location, take into account the space required to route, position, and strain-relieve all cables that will be attached to the back of the ADCU. Directions for proper wiring are presented in Section 2.6, “Wiring the ADCU” on page 29.

Option 1 - Velcro Fastening on a Horizontal Surface

1. Choose a location based upon the guidelines in “Choosing the Best Location for the ADCU” on page 14.
2. Remove the four squares of Velcro fabric from the kitpack. Clean the bottom of the housing with a mild detergent and water to remove oils, etc. Peel the protective backing from the squares and apply them to the bottom of the housing at each of the four corners (see Figure 2-16).



3. Position the four Velcro hook disks where the ADCU will be mounted. Drill screw holes for the disks and secure in place with the #4-24 screws supplied in the kitpack.
4. Press the ADCU firmly into place so that the loop material engages the hook disks.

Figure 2-16

*Mounting the ADCU with
Velcro Attachments*

Option 2 - Flush-mounting

1. Choose a location based upon the guidelines in *"Choosing the Best Location for the ADCU"* on page 14.
2. A template has been provided in *Appendix C* on page 129 as a guide to mark and cut the proper hole for the flush mount bracket. Cut the hole and make certain the bracket and ADCU will fit easily.
3. Attach the flush mount bracket to the ADCU by loosening the two screws on the underside of the ADCU. Slide the flush mount bracket backward over the ADCU until the two notches meet the screws as shown in Figure 2-17.

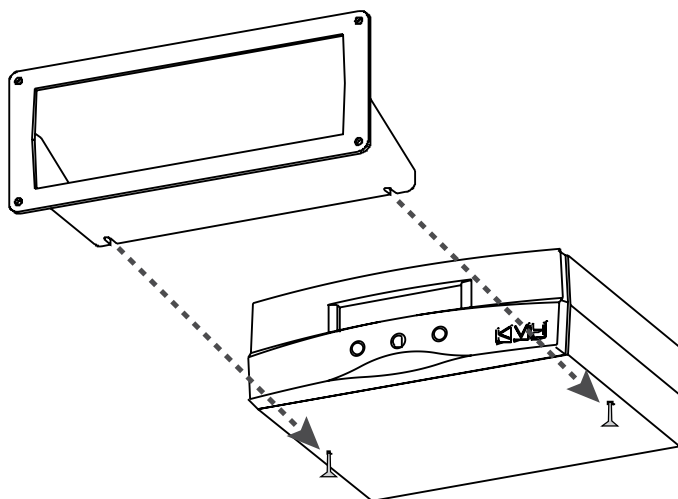


Figure 2-17

Securing the ADCU to the Flush Mount Bracket

4. Tighten the screws to secure the ADCU to the bracket.
5. After completing the wiring described in *Section 2.6, "Wiring the ADCU,"* insert the ADCU and bracket into the hole and secure the unit to the mounting surface with the #8 (black) screws and #8 washers supplied in the kitpack.

2.5 Connecting the IRD(s)

For the TracVision system to work, you must connect the following cables to your satellite TV receiver(s) (IRDs):

- RF Cable
- Ground Wire

Connecting the RF Cable(s)

Each RF cable must be an RG-11 (75 ohms) or RG-6 (75 ohms) cable fitted with F-type connectors. The RF cable(s) should already be connected to the antenna baseplate (see Step 12 of Section 2.2., “Mounting the TracVision Antenna” on page 17). The following sections explain how to connect the RF cable(s) to your IRD(s).



For instructions on RF wiring for TracNet, please refer to the TracNet Owner's Manual or Technical Manual.



Before you connect an RF cable to an IRD, turn on the IRD and TV and verify that there is no AC voltage present on the IRD's input connector, measured between center conductor and shield. If AC voltage is present on the connector, **DO NOT** connect the RF cable until you have corrected the problem. This is a potentially dangerous condition that will damage the antenna's electronics.

To connect the TracVision antenna to your IRD(s), choose one of the following configurations (based on the number of IRDs you will connect to the antenna):

Option 1 - Connecting One IRD

Option 2 - Connecting Two IRDs

Option 3 - Connecting Three or More IRDs
(North American systems only)

Option 1 - Connecting One IRD

One end of the RF cable should already be connected to the connector labeled “RF1” on the base of the TracVision antenna. Connect the other end of the RF1 cable to the IRD connector labeled “LNB,” “ANT/SAT,” or “SATELLITE IN.”

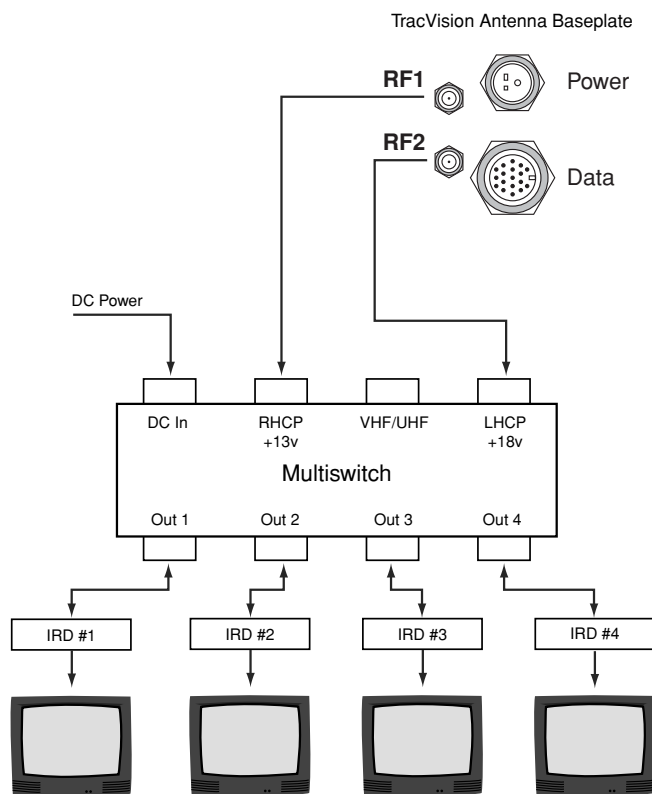
Option 2 - Connecting Two IRDs

Two RF cables should already be connected to the connectors labeled “RF1” and “RF2” on the base of the TracVision antenna. Connect the other ends of these RF cables to the connector labeled “LNB,” “ANT/SAT,” or “SATELLITE IN” on the two IRDs.

The IRD that is connected to the RF1 cable controls which satellite the antenna is tracking. The IRD connected to RF2 can select different channels on that satellite but not change the satellite selection itself.

Option 3 - Connecting Three or More IRDs (North American Systems only)

To connect three or four IRDs to the TracVision antenna, you will need to install an active multiswitch (Channel Master model 6214IFD or equivalent) between the antenna and the IRDs. Two RF cables should already be connected to the connectors labeled "RF1" and "RF2" on the base of the TracVision antenna. Figure 2-18 shows a typical wiring arrangement for three or four IRDs. Mount the multiswitch unit in accordance with the manufacturer's instruction sheet.



1. Connect the RF cable labeled "RF1" to the multiswitch input labeled "LNB RHCP +13V."
2. Connect the RF cable labeled "RF2" to the multiswitch input labeled "LNB LHCP +18V."
3. Connect the multiswitch outputs to individual IRD inputs. Use RG-6 cable with F-type connectors for all RF connections. Terminate all unused output connectors with 75 ohm DC blocks (Channel Master #7184, Radio Shack #15-1259 or equivalent).



Due to the signal polarization in European satellites, the use of a multiswitch will result in a loss of signal and less than optimal operation with TracVision G4 systems used in Europe.

Figure 2-18

*Single Multiswitch Installation
(North American systems only)*



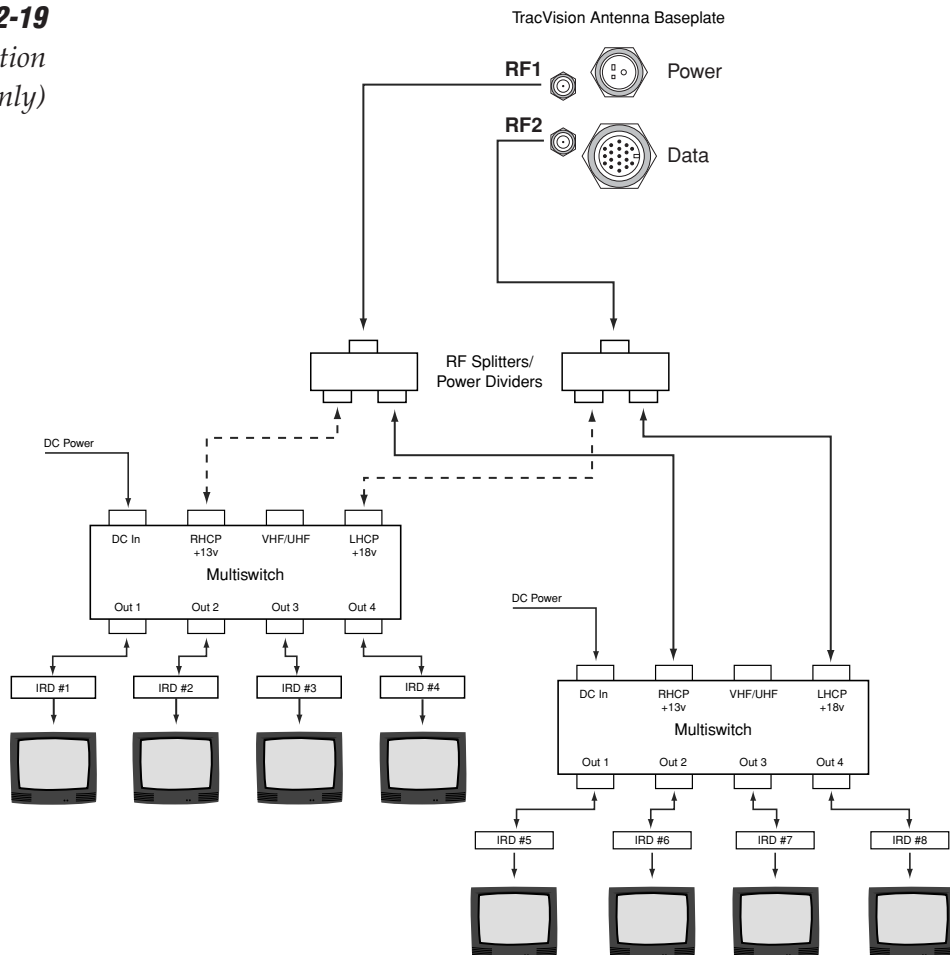
The use of an active multiswitch will interfere with the 22 KHz tone sent by DIRECTV DSS Plus™ IRDs to the antenna. As a result, the antenna will not receive the signal to change satellites when you change channels using your DIRECTV DSS Plus remote. You will need to use the ADCU front panel buttons to switch between satellites.

Multiple Multiswitch Installation

If you need to connect more than four IRDs to the TracVision antenna, you may carry out a multiple multiswitch installation, as shown in Figure 2-19.

Figure 2-19

*Multiple Multiswitch Installation
(North American systems only)*



Connecting the IRD Ground Wire



Be sure to connect a ground cable from each IRD to a suitable DC ground, ideally the ADCU ground terminal.

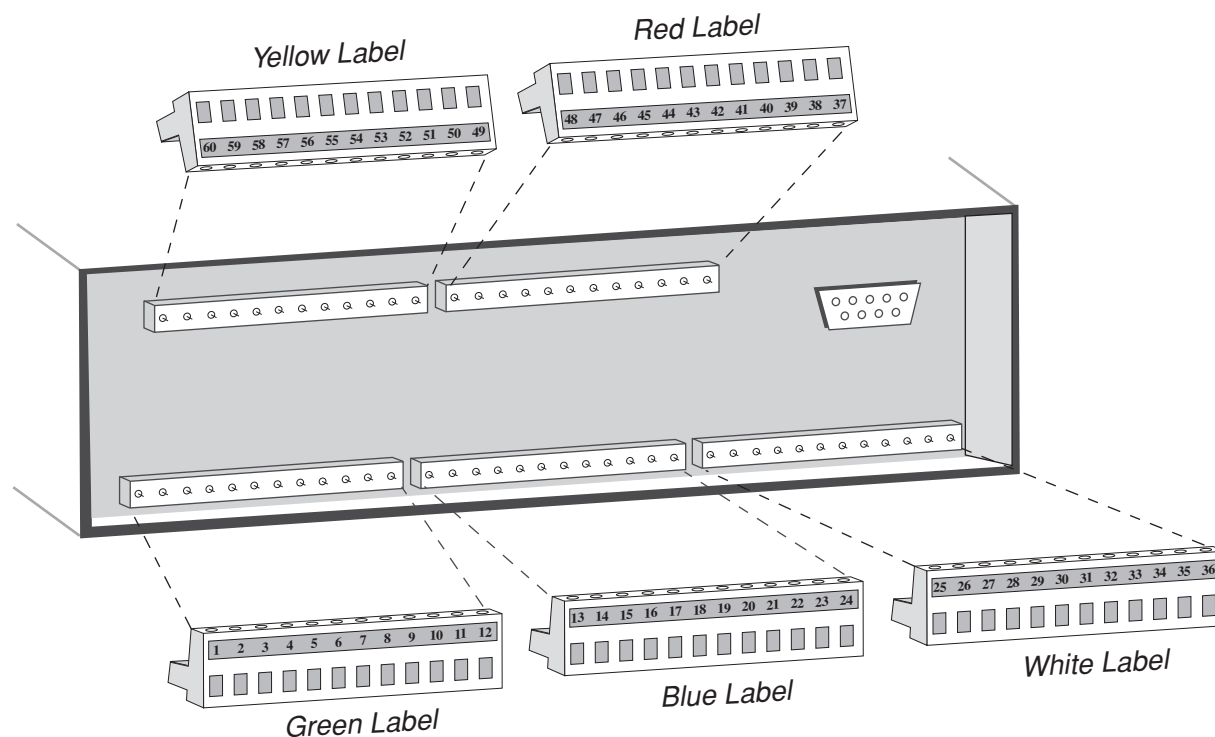
A grounding wire has been provided to connect your IRD to a suitable ground. Attach the grounding wire to any suitable screw on the rear panel of the IRD with a good contact with the IRD chassis. The other end should be connected to a suitable DC ground, ideally to the ADCU ground terminal (*route the ground wire to the ADCU and leave unconnected for now*). **Each IRD that you connect to the TracVision system should have a similar ground connection.**

If you are using a multiswitch, you can ground the multiswitch instead of the individual IRDs.

2.6 Wiring the ADCU

All other wiring for the TracVision system connects at the rear panel of the ADCU. Included in the GyroTrac kitpack are five terminal strip connectors with terminal connectors numbered 1 through 60 (see Figure 2-20). You will connect all wires to these terminal strip connectors first, then you will insert the connectors into the rear panel of the ADCU.

Figure 2-20
Terminal Strip Connectors



For the TracVision system to work, you must wire the following cables to the ADCU:

- Antenna Data Cable
- Antenna Power Cable (*unless you are connecting antenna power to its own circuit*)
- GyroTrac Sensor Cable
- Vessel Power Cable
- IRD Ground Cable(s)

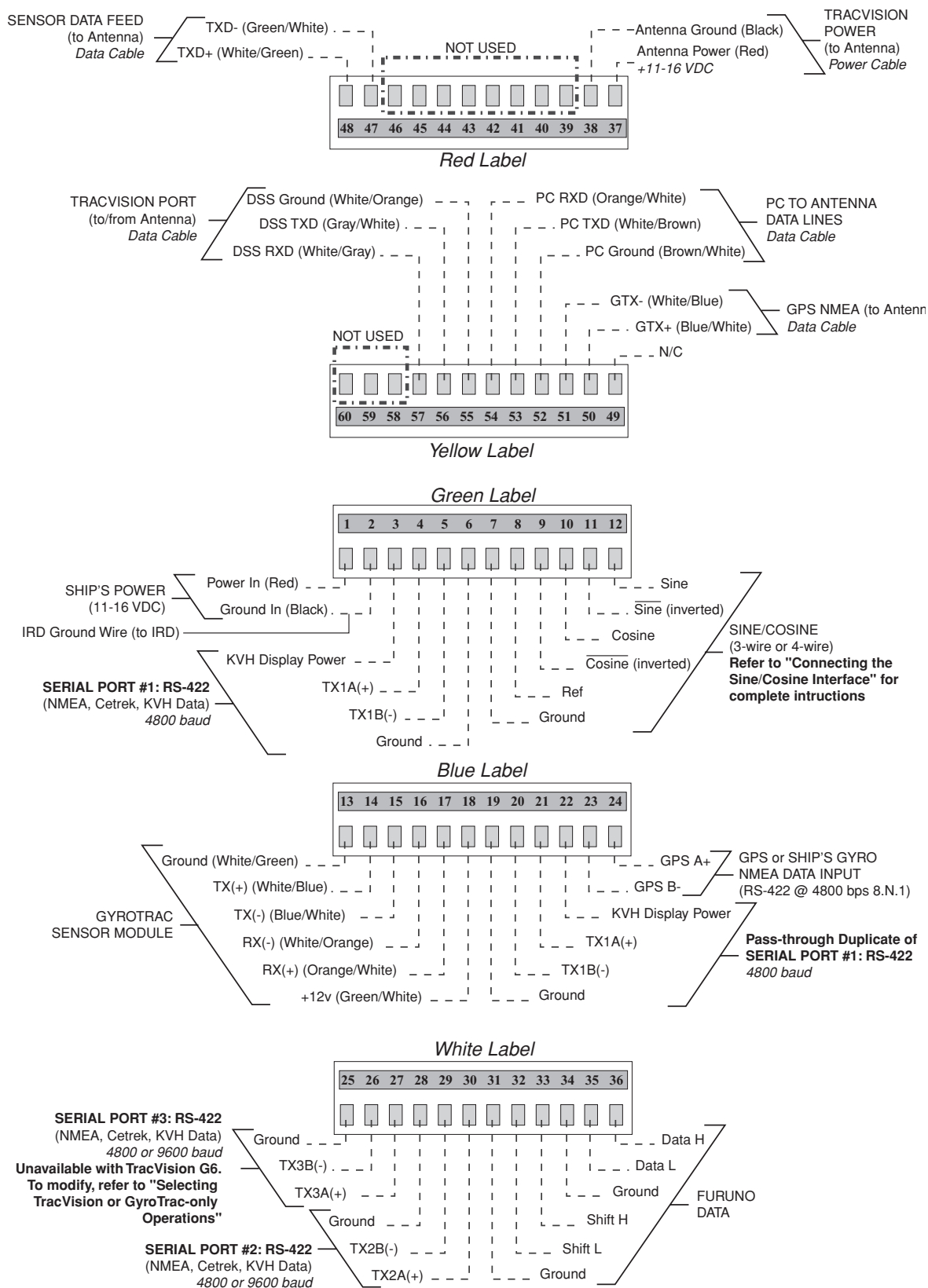


Connect all wires to the terminal strip connectors first. **DO NOT** attach the terminal strip connectors to the ADCU until you have completed and verified all wiring.

You may also connect other external devices, such as an autopilot, plotter, remote display, or GPS, to the ADCU.

Figure 2-21 on the following page shows all available connections to the ADCU.

ADCU Wiring



Tips for Safe and Successful Wiring

- When inserting a wire into a terminal connector, make certain that the wire insulation is not pinched in the connector.
- After inserting and securing wire, tug gently to ensure that the connection is solid.
- Position cables behind the ADCU so that they connect neatly to the terminal strips.
- Do not tin (solder) the wire ends.
- Each cable provided with the TracVision G4 should be routed and dressed before terminating at the ADCU. The antenna data and power cable wires may be trimmed to desired length. However, be sure to cut back the drain wire (shield); do **NOT** connect the drain wire to anything.



Do **NOT** connect the antenna data cable's drain wire (shield).

Connecting the Antenna Data Cable

Connect the antenna data cable to the red and yellow ADCU terminal strip connectors as shown in Figure 2-22.

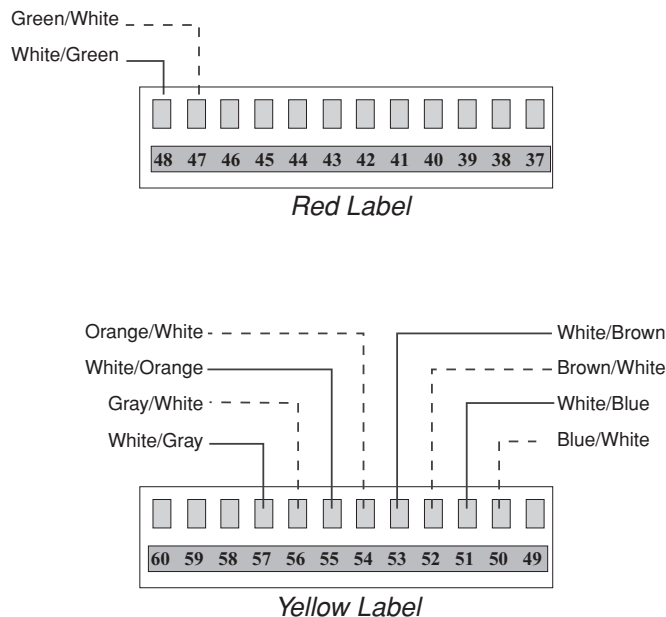


Figure 2-22

Antenna Data Cable to ADCU Wiring



Cut back and insulate any unused wires from the Data Cable.

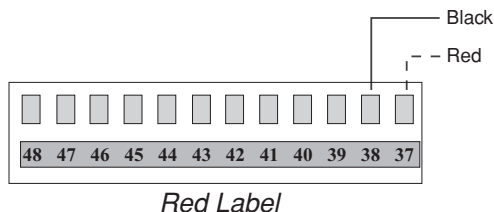


A comprehensive wiring diagram of the entire TracVision G4 system has been provided for technical reference in Appendix D on page 131. **A color quick reference guide to wiring the TracVision G4 is also provided on the inside front cover of this manual.**

Connecting the Antenna Power Cable

For single-switch convenience, the ADCU has been designed to serve as a junction box between ship's power and the antenna unit. Connect the antenna power cable to the red ADCU terminal strip connector as shown in Figure 2-23.

Figure 2-23
*Antenna Power Cable
to ADCU Wiring*



The antenna unit's power cable connector cannot accept cables larger than 14 AWG (1.5 mm²).

Alternate Method of Providing Power to the Antenna (*Optional*)

Rather than using the ADCU as its power source, the antenna unit can be connected directly to a separate 5-amp switch and breaker if such a configuration is more convenient or if the ADCU is placed more than 50 ft (15 m) from the antenna unit. For example, this configuration would be preferred if you needed to be able to turn off the antenna while keeping the GyroTrac powered on.

If the power cable is longer than 50 ft (15 m), be sure to verify the voltage at the antenna to ensure that there is sufficient power to drive the antenna under load (11-16 VDC). If not, carefully increase the voltage to the antenna unit to compensate for any drop in power over the length of the cable and ensure that the voltage reaching the antenna unit is between 11 and 16 VDC.

Do NOT connect the antenna to vessel power until all other wiring is completed. Also, be sure to follow the same power wiring guidelines provided in "Connecting the ADCU to Vessel Power" on page 37.

Connecting the GyroTrac Sensor Cable

1. Connect the connectorized end of the sensor cable to the GyroTrac sensor module. Twist until locked in place.

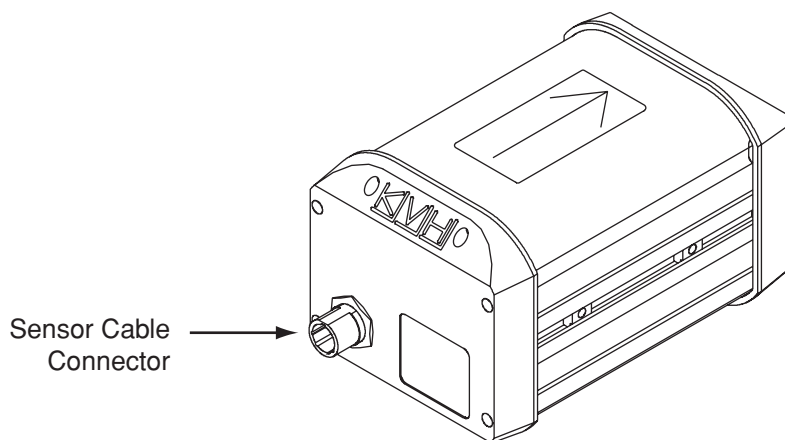


Figure 2-24

GyroTrac Sensor Connector

2. Connect the other end of the sensor cable to the blue ADCU terminal strip connector as shown in Figure 2-25.

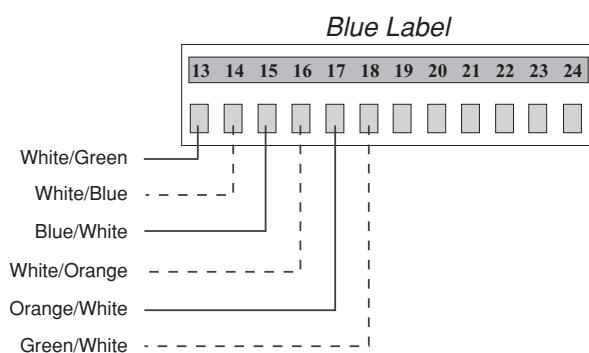


Figure 2-25

Sensor Cable to ADCU Wiring



If the ADCU is receiving data from a ship's gyro, all compass outputs are automatically configured as True North and cannot be set to Magnetic.

Connecting External Devices to the ADCU (Optional)

GyroTrac can be integrated with many types of onboard equipment, including autopilots, radars, remote displays, plotters, global positioning systems (GPS), and computers. All connections between the ADCU and external devices are made at the terminal strip connectors located on the rear of the ADCU. Follow these guidelines when wiring additional equipment to the ADCU:

- Make certain any additional equipment complies with NMEA Standard 2.2.
- Data conductor wire should be minimum 18 AWG (0.75 mm²), twisted pair, stranded, tinned marine cable.
- Do not use cables with a wire diameter larger than 12 AWG (2.5 mm²), as this is the largest size the ADCU connector plugs can accept.
- The cable provided with the optional KVH rotating card display is fully compatible with GyroTrac requirements. Note that cables to other external devices should follow the manufacturer's recommendations.
- For power cable specifications, refer to Table 2-2 on page 10.

As noted in Figure 2-21 on page 30, the output for Serial Ports 2 and 3 can vary from 4800 baud to 9600 baud. This is determined automatically based upon the selected output. Serial Port 1 provides 4800 baud output only.

When the TracVision G4 antenna is connected to the GyroTrac system, GyroTrac Serial Port 3 will not be able to provide output to other equipment. Serial Port 3 will only provide outputs if the antenna unit is disconnected from the ADCU and GyroTrac is configured to operate as a stand-alone system as described in *"Selecting TracVision or GyroTrac-only Operations"* on page 76.

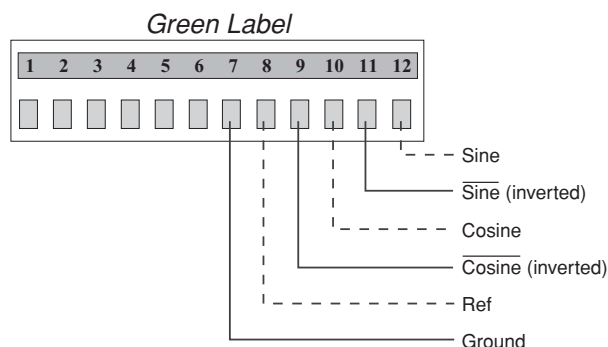
Connecting the Rotating Card Display (Optional)

For complete instructions on properly wiring the optional rotating card display, refer to *Appendix E on page 135*.

Connecting the Sine/Cosine Interface (Optional)

The GyroTrac ADCU sine/cosine interface provides the following outputs:

- sine
- cosine
- inverse sine
- inverse cosine
- reference voltage



Because the reference voltage is a reference output, not an input, connecting this output to another reference output from an autopilot or other system will cause problems.

In this case, connect the following wires from the autopilot (or other system) to the green ADCU terminal strip connector:

Autopilot/Other System Wire	Terminal Connector
Sine	12
Cosine	10
Internal Power Ground (not chassis ground!)	7
Reference (INPUT)	8 (KVH Output)

DO NOT connect the autopilot or other system to the ADCU reference output (ADCU terminal 8) if the autopilot has its own internal reference. Review the user's manual for the selected equipment.

Figure 2-26

Sine/Cosine ADCU Wiring



The sine/cosine reference voltage is an OUTPUT, not an INPUT. Connecting this output to the reference output for an autopilot or other system can cause problems. This section explains how to resolve most issues.

Table 2-6

GyroTrac/Autopilot Sine/Cosine Wiring Arrangement



Before connecting the Autopilot internal ground to ADCU terminal 7, use a low impedance voltmeter to make certain that there is no DC voltage between the two terminals. A DC surge could damage one or both systems.



When the vessel is stationary, certain GPS models may not output the data required for GyroTrac to determine true north.

To adjust the GyroTrac reference to match the reference of the autopilot (or other system), connect a voltmeter to GyroTrac ADCU terminal (#8) and the reference terminal of the autopilot (or other system). Adjust the GyroTrac reference voltage as described in “Setting the Sine/Cosine Data Output” on page 69 until the voltmeter indicates 0 VDC.

The sine/cosine interface should now operate with optimal precision.

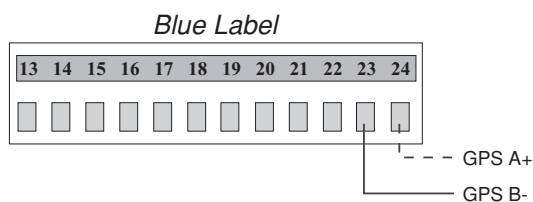
Connecting GPS for True North Capability *(Optional)*

GyroTrac is capable of determining true north that is accurate, under most conditions, to within $\pm 1^\circ$. This capability requires a GPS data input to the GyroTrac

NMEA sentences from the GPS must contain one or all of the following sentences: VTG, VHW, or BWC. The sentence structure must comply with the NMEA 0183 V2.20 standard and run at 4800 bps 8.N.1.

As illustrated in Figure 2-27 and the GyroTrac wiring quick reference guide on the back cover of this manual, GPS interface cables connect to the blue ADCU terminal strip connector at terminals 23 and 24. Refer to your GPS user manual for the correct NMEA data out configuration.

Figure 2-27
GPS to ADCU Wiring



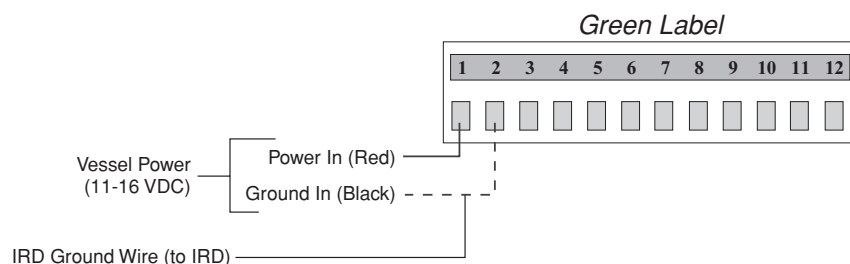
Connecting the ADCU to Vessel Power

Short circuits may result in severe electrical shock or burns. Turn off vessel power and test the circuit to ensure that no power is present before connecting any power cables. **Do NOT reapply power until all system wiring is completed and all terminal strip connectors are installed on the ADCU rear panel, as described in “Connecting the Terminal Strip Connectors to the ADCU” on page 38.**

The TracVision G4 system requires an 11-16 VDC power input. Since it does not have a dedicated power control (ON/OFF switch), a quick-tripping circuit breaker or fuse should be installed between vessel power and the ADCU. Circuit overload protection should be rated for 5 amperes. For recommended power cable specifications, refer to Table 2-2 on page 10.

If vessel power fluctuates widely or is noisy, a 12 VDC, 5-amp AC/DC power supply or a wide-range DC/DC converter power supply should be installed. *Test the voltage and polarity before making connections to vessel power.*

Connect power to the green ADCU terminal strip connector as shown in Figure 2-28. If the user-supplied power cable has a drain or shielded wire, **DO NOT** connect the drain or shield to either the ADCU or to ground.



Connecting the IRD Ground Wire

If you've routed an IRD ground wire to the ADCU (as recommended in “Connecting the IRD Ground Wire” on page 28), connect the wire to terminal 2 of the green ADCU terminal strip connector (see Figure 2-28).



Before connecting the power cable, turn off vessel power and test the circuit to ensure that no power is present.



*Power supplied to the TracVision G4 **MUST NOT** exceed 16 VDC or the TracVision power supply will suffer serious damage!*

Figure 2-28
Vessel Power to ADCU Wiring

Connecting the Terminal Strip Connectors to the ADCU

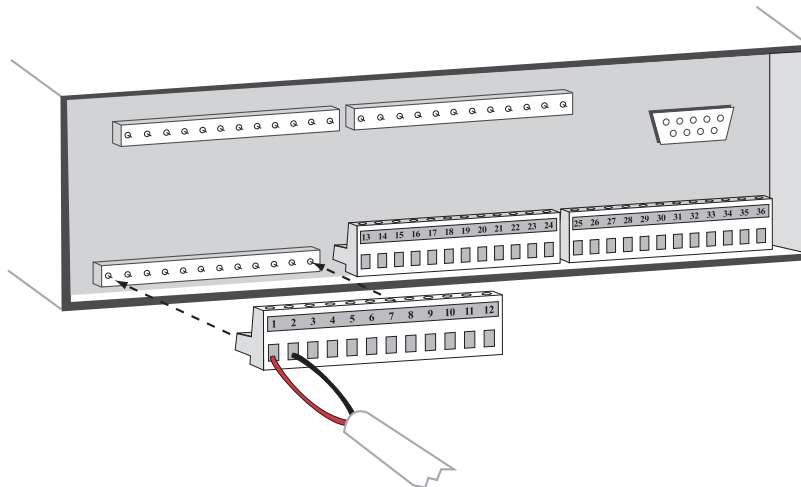
Now that you have connected all wires to the terminal strip connectors, insert the connectors into the ADCU's rear panel as shown in Figure 2-29.

Figure 2-29

Attaching the Terminal Strips to the ADCU



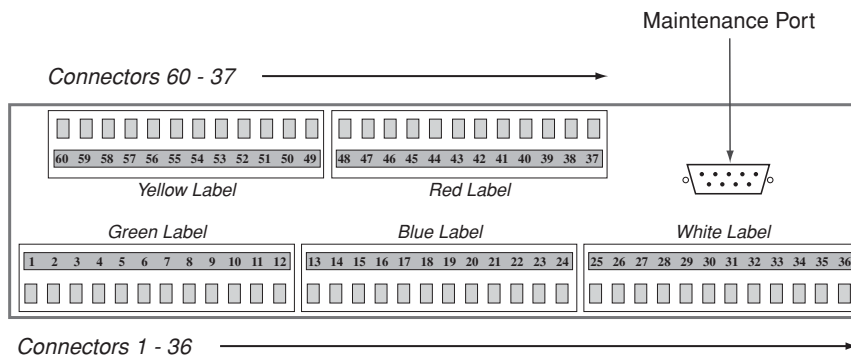
Double-check all wiring. Be certain to plug terminal strips into the correct positions. If wiring is incomplete or incorrect or the terminal strips exchange positions, serious electrical damage can occur to the TracVision antenna unit, the GyroTrac, and interfacing electronics.



Be sure to attach the terminal strip connectors in their correct positions, as shown in Figure 2-30.

Figure 2-30

Proper Terminal Strip Order



Effective Strain Relief for ADCU Terminal Connections

Due to both the potential number of wires that connect to the rear of the ADCU and the dynamic environment aboard ship, it is critical that the terminal connections be properly strain-relieved using tie-wraps (a number of which are included in the GyroTrac kitpack).

Some things to consider when strain-relieving wires:

- There should be no tension on the wires connecting to the terminal strips. Removing slack is important, but the wires should not be taut.
- Leave enough slack in the wires to allow easy access to the ADCU's rear panel in case of future software upgrades.
- If the cable is equipped with a ferrite, the ferrite should be as close as possible to the terminal connections.
- Strain-relieve wires and cables as close to the ferrite as possible. A good arrangement includes a tie-wrap behind the ferrite (on the side furthest from the ADCU); an ideal design includes a tie-wrap on either side of the ferrite.

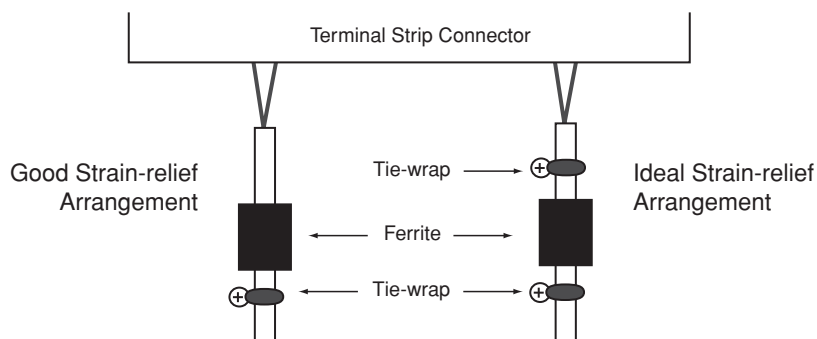


Figure 2-31

Examples of Effective Strain Relief

2.7 Calibrating the Sensor

Every sensor module is calibrated at the factory in a perfect-world environment. However, hard and soft iron effects on your vessel can distort the local magnetic field, causing errors in the reported heading. These errors are minimized by mounting the sensor module in a suitable location and are further removed by GyroTrac's autocalibration feature, which compensates for minor magnetic distortions.



You must calibrate the GyroTrac sensor after installation so that it can compensate for any magnetic distortions.



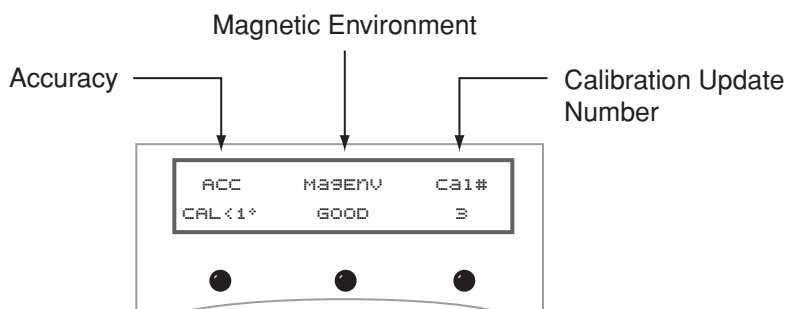
The ADCU is equipped with a fuse to protect against high-voltage spikes. If the system is installed correctly and power is available, but the system is non-functional, refer to Section 4.3, "GyroTrac-specific Issues" on page 97 for instructions on checking and replacing the fuse.

After installing the GyroTrac, you must calibrate the sensor as described below and achieve a good calibration score to ensure the highest degree of heading accuracy.

1. Select a calm day and a clear area. Avoid excessive pitching and rolling, as this can distort the calibration data.
2. Apply power to the ADCU and note your approximate heading so that you will know when you have completed a full circle.
3. Steer your vessel at a slow, steady speed through a full circle that takes at least 2 minutes to complete. (Try to time your turn so that it takes 30 seconds or more to turn 90°.) After completing a full circle, continue the process with a second circle. The circles do not need to be perfectly round as long as you make a complete 360° turn.
4. Once you have completed two full circles, your GyroTrac should be calibrated. Check the calibration score as described on the following page.

The Calibration Score

Each calibration results in a calibration score that is stored in the system's memory.



Accuracy (ACC)

The ACC data indicates the degree of accuracy the GyroTrac will provide based on the quality of the last calibration. Table 2-7 lists the five possible accuracy levels.

Magnetic Environment (MAGENV)

The MAGENV score (GOOD, OK, POOR, BAD) indicates the quality of the installation location. If the quality is POOR or BAD, the sensor module probably should be moved to a more favorable magnetic environment.

Calibration Update Number (CAL #)

The CAL # indicates the number of times the sensor has been calibrated. It is used primarily to verify whether a new calibration has been accepted by the system.

Figure 2-32

Sample Calibration Score Screen

Table 2-7

Possible Compass Accuracy Levels

ACC Score	Accuracy
<1°	Better than 1°
<2°	Better than 2°
<4°	Better than 4°
<8°	Better than 8°
BAD CAL	Recalibrate



For guidelines on finding a suitable location, refer to “Choosing the Best Location for the GyroTrac Sensor” on page 14.



A complete explanation of the GyroTrac menus is provided in Section 3, “Using the ADCU Interface” on page 59. Specifics regarding calibration are provided in Section 3.6, “Control Compass Mode” on page 77.

2.8 Activating/Programming the IRD

Before it can be used, your IRD (satellite receiver) must be activated and/or programmed, as described below.

DIRECTV Activation

KVH makes it easy to activate your DIRECTV IRD. Just call KVH at 1-888-584-4163 and select the **TracVision Product Activation Department** (Monday - Friday, 8:30 a.m. - 5:00 p.m. EST).

DISH Network Activation

To activate your DISH Network IRD, please call DISH Network directly at 1-800-333-DISH (3474).

Other IRD Activations

Please refer to the user manual that accompanied your IRD for activation instructions.

Programming European IRDs

Before the TracVision G4 system can be used in Europe, the IRD must be programmed to receive signals from the selected DVB satellite services. Programming is conducted using menu selections displayed on the TV screen. Please refer to your IRD owner's manual for specific instructions.

Table 2-8 provides some key data for use when programming the IRD.

Table 2-8
Key IRD Settings



When programming the IRD with the antenna configuration data, make certain that your choices for Antenna Alternatives 1 and 2 match those installed as Satellites A and B during the Install Satellite procedure detailed in Section 2.9, "Installing Satellites Using the ADCU" on page 44.

Configuration Item	Setting
Antenna Alternative 1	DiSEqC 1
Antenna Alternative 2	DiSEqC 2
LNB Frequency	Universal

It is also important that the IRD's settings for Antenna Alternatives 1 and 2 match the ADCU's installed satellite settings as follows:

- Antenna Alternative 1 = Satellite A
- Antenna Alternative 2 = Satellite B

Section 2.9, "Installing Satellites Using the ADCU" on page 44 provides details on the satellite installation process.

Programming DSS Plus IRDs

If you are using multiple DSS Plus IRDs and intend to shift from one satellite to another, **only one** of the IRDs can be configured as a two-satellite receiver. All other IRDs must be configured as one-satellite receivers. The two-satellite IRD will determine which satellite the antenna is tracking while the other receivers can watch any channels available via that satellite. Refer to your IRD owner's manual for complete details on this process.



If you use an active multiswitch to connect three or more IRDs, the multiswitch will interfere with the 22 KHz tone sent by DIRECTV DSS Plus™ IRDs to the antenna. As a result, the antenna will not receive the signal to change satellites when you change channels using your DIRECTV DSS Plus remote.

2.9 Installing Satellites Using the ADCU

The TracVision G4 can track a variety of DVB-compatible and DIRECTV (DSS) satellites. The system contains a preprogrammed library of North American and European satellites. It also has two open slots that you may use to program two additional satellites of your choice. Tables 2-9 and 2-10 list the possible satellite pairs. Two of these satellites may be selected to reside in the system's active memory as Satellites A and B.

Table 2-9

Available Satellite Pairs

– North America

(North American LNB required)

	DSS_101	DSS_119	Echo_61	Echo_110	Echo_119	Echo_148	Expressvu	ExpressTV
DSS_101		✓					✓	✓
DSS_119	✓						✓	✓
Echo_61				✓	✓		✓	✓
Echo_110			✓		✓	✓	✓	✓
Echo_119			✓	✓		✓	✓	✓
Echo_148				✓	✓		✓	✓
Expressvu	✓	✓	✓	✓	✓	✓		✓
ExpressTV	✓	✓	✓	✓	✓	✓	✓	

Table 2-10

Available Satellite Pairs – Europe

(European LNB required)

	Astra 1	Astra 2N	Astra 2S	Hispasat	Hotbird	Sirius	Thor
Astra 1		✓	✓		✓	✓	
Astra 2N	✓				✓		
Astra 2S	✓				✓		
Hispasat							
Hotbird	✓	✓	✓			✓	
Sirius	✓				✓		✓
Thor						✓	

The satellites listed in TracVision G4's preprogrammed satellite library will be sufficient for most users. However, if you wish to install one or two satellites that are not in the library, skip to "Programming User-defined Satellites" on page 47. After configuring these user-defined satellites, return to the satellite installation process in "Installing Your Selected Satellites" on page 45.

Installing Your Selected Satellites

To install your selected satellites as Satellite A and B, follow the steps below.

1. Apply power to the ADCU.
2. Following the startup sequence, press the center button until the “Control Antenna?” screen appears.

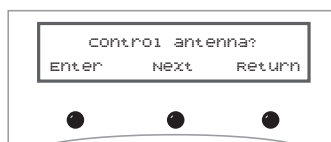


Figure 2-33

Control Antenna Screen

3. Press the **ENTER** button to access the Control Antenna Mode.
4. Press the center button until the “Install Satellite?” screen appears.



Figure 2-34

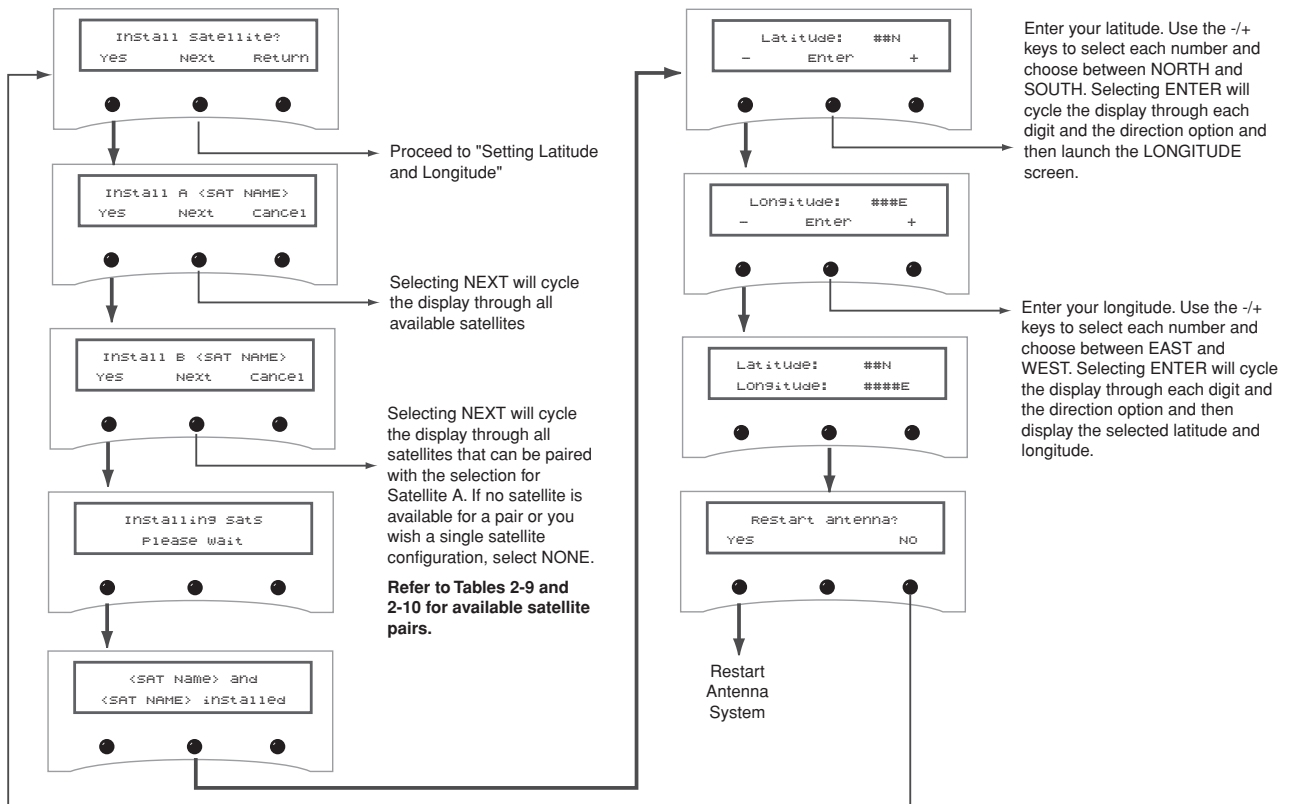
Install Satellite Screen

5. Follow the process shown in Figure 2-35 on the following page to install your selected satellites. At the end of the process, be sure to press the **YES** button to restart the antenna.



Section 3, “Using the ADCU Interface” on page 59 *provides complete details on the use of the ADCU menus, including complete antenna control details in* Section 3.8, “Control Antenna Mode” on page 81.

Figure 2-35
Install Satellite Process



If a GPS is providing latitude and longitude to TracVision G4, this data will automatically be used in the satellite installation process. In this event, the Latitude/Longitude menus will skip directly to "Restart Antenna."

Programming User-defined Satellites

The TracVision G4 satellite library has the capacity for two user-defined satellites in case you want to track a satellite that is not currently preprogrammed in the library. User-defined satellites can only be configured via the ADCU's maintenance port. To configure a user satellite, information about the satellite must be provided, including:

- Satellite name
- Satellite position (longitude)
- Transponder information for each of the following polarizations/frequencies:
 - vertical high
 - vertical low
 - horizontal high
 - horizontal low
- OR**
- right
- left
- Transponder information includes:
 - frequency
 - symbol rate
 - FEC code
 - network ID (in hexadecimal format)

This information can be obtained from your satellite service provider or from a number of sites on the Internet, such as www.satcodx.com.



How to tell the difference between High and Low bands:

High: 11.700 - 12.750 GHz

Low: 10.700 - 11.700 GHz



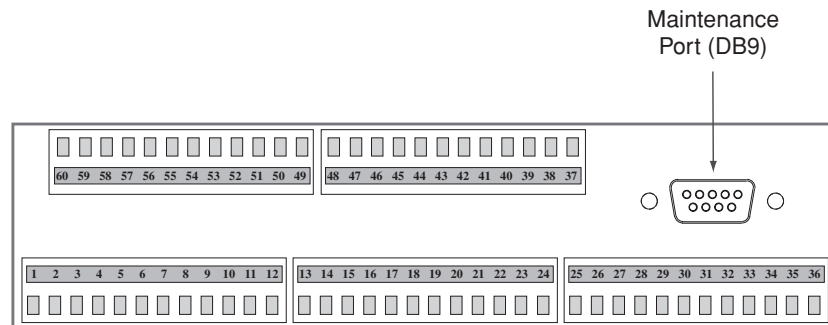
For your reference, the satellite configuration information for the predefined satellites is available on our web site at www.kvh.com/footprint.

Connecting a PC to the ADCU Maintenance Port

To program your user-defined satellites into the TracVision G4 satellite library, you need to connect a PC to the ADCU's maintenance port. This procedure requires Windows Hyperterminal (or other terminal emulation software, such as PROCOMM). Use the settings appropriate to your application and follow the steps below.

1. Connect one end of the PC data cable to the DB9 maintenance port connector on the rear of the ADCU. Connect the other end to the serial port on your PC (a 9-pin/25-pin connector adapter may be needed for some PCs).

Figure 2-36
ADCU Maintenance Port



2. Open the terminal emulation software and establish the following settings:
 - 9600 baud
 - no parity
 - 8 data bits
 - 1 start bit
 - 1 stop bit
 - no flow control
3. Apply power to the TracVision G4 system and allow the system to complete full initialization. Data should be scrolling on the PC display to identify any system problems detected. If no data is seen, recheck your connections and the terminal software setup for the correct COM port.

Entering User-defined Satellite Data

To configure your user-defined satellites, follow the steps below.

1. Using your PC's terminal emulation program, type **HALT<cr>** (<cr> indicates a carriage return/ENTER key). This command puts the antenna in Idle mode.
2. Enter the SATCONFIG parser command:

Command:	SATCONFIG,USERX,YYY,Z,D,L<cr>
Where:	X = 1 (USER1 satellite) or 2 (USER2 satellite) YYY = longitude (0-180) Z = E (East) or W (West) D = decoding type (0 = test, 1 = DSS-A, 2 = DSS-B, 3 = DVB) L = LNB polarization (C = circular, L = linear)
Function:	configures one of the user-configurable satellites with the longitude provided
Response:	if valid entry, echoes the input data if invalid entry, returns error message

Table 2-11

SATCONFIG Parser Command

3. Type **@DEBUGON<cr>** to enter DEBUG mode.
4. Enter the satellite's transponder information:

Command:	@SATCONFIG,X,N,F,S,C,ID,P,B,D<cr>
Where:	@SATCONFIG = directs data to the RF Board X = satellite location (A = USER1, B = USER2) N = satellite table # (98 = USER1, 99 = USER2) F = frequency in MHz (either 00000 or a range from 10700 - 12700) S = the satellite transponder symbol rate in Mbit/second (01000 - 29999) C = the FEC code (e.g., 12, 23, 34, 56, 67, 78) ID = the satellite network ID in hexadecimal format (0x####) P = the LNB polarization (V = vertical, H = horizontal, R = right, L = left) B = the LNB down conversion frequency (L = low, H = high, U = USA) D = decoding type (0 = test, 1 = DSS-A, 2 = DSS-B, 3 = DVB)

Table 2-12

Satellite Transponder Data Sequence

5. Repeat Step 4 for each of the following transponder categories:

- vertical high
- horizontal high
- vertical low
- horizontal low

OR

- right
- left

TracVision G4 requires that the data fields for all transponder categories be provided. If the selected satellite does not have information for one or more of the transponder categories, default information should be entered in the fields as follows:

Table 2-13
*Satellite Transponder
Default Data*

Transponder Data	Default Value
Frequency	00000
Symbol Rate	27500
FEC Code	the same value as provided for those transponders with data
Network ID	0x0000
Polarity and Band	whichever combinations are not already provided

6. Type **ZAP<cr>** to restart the antenna.
7. If you need to configure a second user-defined satellite, repeat this procedure starting with Step 1 to enter data for the USER2 satellite.

You have now added your user-defined satellite(s) to the system's satellite library.

If you want the antenna to track one or both of these user-defined satellites, you need to install it. To install a satellite, you can use either the ADCU, as described in *"Installing Your Selected Satellites"* on page 45, or you can use the SATINSTALL command, as described on the following page.

Installing User-defined Satellites via the Maintenance Port

1. Type **HALT<cr>** to put the antenna in Idle mode.
2. Enter the **SATINSTALL** parser command:

Command:	SATINSTALL,<sat_a_name><sat_b_name><cr>
Where:	<div><sat_a_name> = the name of your choice for Satellite A (for example: USER1)</div> <div><sat_b_name> = the name of your choice for Satellite B (for example: USER2)</div>

If you only want to install and track one satellite, enter **NONE** as the name of Satellite B.

3. Once you’ve assigned satellites as Satellite A and Satellite B, you need to tell the antenna which of the two satellites it should initially acquire and track. This step should be performed the first time a satellite is selected, allowing the system to download the channel guide. To do so, enter the following parser command:

Command:	@L,A or B<cr>
Where:	<div>A = track Satellite A</div> <div>B = track Satellite B</div>

4. Type **ZAP<cr>** to restart the antenna.

Examples of the user-defined satellite configuration process are provided for reference in the next two sections.

An Example of Configuring a User-defined Satellite (N. America)

The following is an example of configuring the fictional YOURSAT 123 as the USER1 configured satellite. Prior to configuring this satellite or any others, be certain to get the most up-to-date information from one of the sources previously discussed.

Table 2-14
*Sample Satellite Configuration
Data (North America)*

YOURSAT 123 at 122 West, DVB decoder, Circular Polarization LNB

<i>Right</i>	
Frequency	12.225 GHz
Symbol Rate	20000
FEC Code	5/6
Network ID	4100(dec) = 0x1004
<i>Left</i>	
Frequency	12.456 GHz
Symbol Rate	20000
FEC Code	5/6
Network ID	4100(dec) = 0x1004

Based on this information, the data entered via the PC would look like this:

```

HALT
SATCONFIG,USER1,122,W,3,C
@DEBUGON
@SATCONFIG,A,98,12225,20000,56,0x1004,R,U,3
@SATCONFIG,A,98,12456,20000,56,0x1004,L,U,3
@SAVE,A
ZAP

```

To install and start tracking the USER1 satellite, the following additional data would be entered:

```

HALT
SATINSTALL USER1,NONE
@L,A
ZAP

```

An Example of Configuring a User-defined Satellite (Europe)

The following is an example of configuring the fictional YOURSAT 123 as the USER1 configured satellite. Prior to configuring this satellite or any others, be certain to get the most up-to-date information from one of the sources previously discussed.

Yoursat 123 at 7 West, DVB decoder, Linear Polarization LNB

<i>Horizontal High</i>	
Frequency	11.966 GHz
Symbol Rate	27500
FEC Code	3/4
Network ID	2048(dec) = 0x0800
<i>Vertical High</i>	
Frequency	11.823 GHz
Symbol Rate	27500
FEC Code	3/4
Network ID	2048(dec) = 0x0800
<i>Vertical Low</i>	
No Data Listed	
<i>Horizontal Low</i>	
No Data Listed	

Table 2-15

Sample Satellite Configuration Data (Europe)

Based on this information, the data entered via the PC would look like this:

```

HALT
SATCONFIG,USER1,7,W,3,L
@DEBUGON
@SATCONFIG,A,98,11966,27500,34,0x0800,H,H,3
@SATCONFIG,A,98,11823,27500,34,0x0800,V,H,3
@SATCONFIG,A,98,00000,27500,34,0x0000,V,L,3
@SATCONFIG,A,98,00000,27500,34,0x0000,H,L,3
@SAVE,A
ZAP

```

To install and start tracking the USER1 satellite, the following additional data would be entered:

```

HALT
SATINSTALL USER1,NONE
@L,A
ZAP

```

2.10 Setting the Skew Angle (European Systems Only)

To optimize channel reception, the antenna's LNB skew angle must be adjusted. Refer to your satellite service provider for the proper skew angle for your selected satellite service and geographical location. You can also find the proper skew angle from the ADCU, as long as a GPS is providing data to the ADCU or the vessel's correct latitude and longitude are entered into the ADCU. Refer to "Antenna Status Data Screens" on page 80 for details on viewing the ADCU-calculated skew value.

Adjusting the LNB Skew Angle

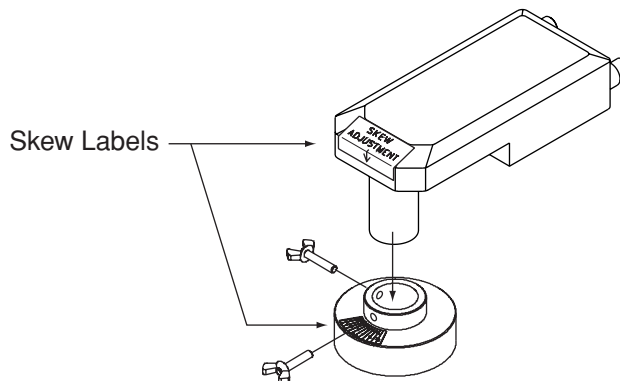
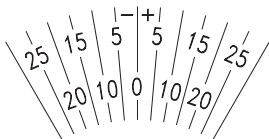
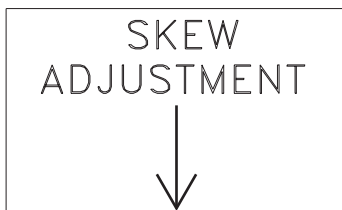
1. Turn off the power to the antenna unit.
2. If the radome is not already removed, remove the radome and set it aside in a safe place.
3. Loosen the two wing screws securing the LNB within the choke feed as illustrated in Figure 2-37.

Figure 2-37

*Adjusting the European
LNB Skew Angle*

Figure 2-38

Skew Angle Labels



4. Refer to the LNB skew angle labels on the end of the LNB and on the LNB choke feed (shown in Figure 2-38) and adjust the LNB as necessary to match as closely as possible the skew angle provided by your service provider or the ADCU.
5. Retighten the wing screws.
6. Reinstall the radome. Align the three radome screw holes with the baseplate nut holders, insert the #10-24 screws and tighten. Install a protective plastic screw cap over each screw.

2.11 Checking Out the System

Now that you've installed the TracVision G4, you need to verify that the system functions properly. Check the system startup routine to ensure that the system is operating within normal parameters.

To view the startup routine, connect a PC to the ADCU's maintenance port. The diagnostics procedure requires Windows Hyperterminal (or other terminal emulation software, such as PROCOMM). Use the settings appropriate to your application.

1. Connect one end of the PC data cable to the DB9 maintenance port connector on the rear of the ADCU. Connect the other end to the serial port on the PC (a 9-pin/25-pin connector adapter may be needed for some PCs).

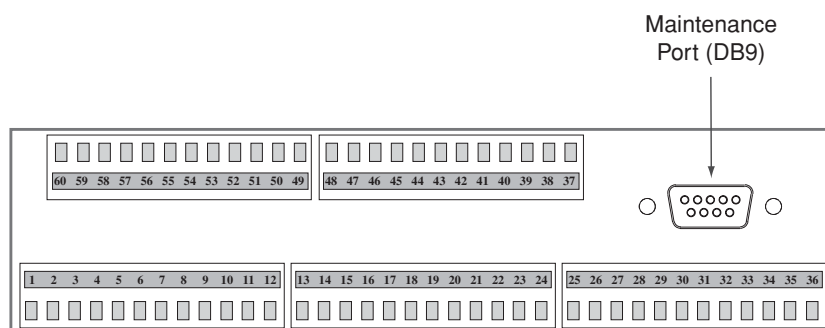


Figure 2-39

ADCU Maintenance Port

2. Open the terminal emulation software and establish the following settings:
 - 9600 baud
 - no parity
 - 8 data bits
 - 1 start bit
 - 1 stop bit
 - no flow control
3. Apply power to the TracVision G4 system and allow the system to complete full initialization. Data should be scrolling on the PC display to identify any system problems detected. If no data is seen, recheck your connections and the terminal software setup.



A sample startup sequence has been provided in Appendix F on page 143 with the typical ranges and responses for the TracVision G4 during startup and operation.



Be certain to fill out and submit the warranty card to KVH to ensure that your TracVision G4 is fully covered under the 2-year parts and 1-year labor warranty.

4. After completing the review of the startup and operational routines, turn on the IRD and television and check the channels on the selected satellites. For European systems, check both horizontally and vertically polarized channels, if possible.
5. When all checks are completed, shut down the system.

2.12 Changing Geographic Location

If you move to a different geographic area, you will need to modify your TracVision G4 system to receive satellite TV signals in the new location. To begin receiving satellite signals in the new area, perform the following steps.

Swap LNBs

To receive the proper satellite signals in the new geographic location, your TracVision antenna must be equipped with the appropriate LNB for that location. If moving to the U.S., you will need to install a North American-style LNB; if moving to Europe, you will need to install a European-style LNB. Table 2-16 lists the part numbers for ordering these LNB options.

Part Name	Part Number
European-style LNB Replacement Kit	02-1033-02
North American-style LNB Replacement Kit	02-1033-01

Table 2-16

LNB Part Numbers

With the new part, you will receive a simple instruction sheet for swapping the LNBs.

Install New Satellites

When you move to a new area, the list of available satellites changes. If you're moving to the U.S., you will need to choose a new satellite pair from the list of available North American satellites (see Table 2-9). If you're moving to Europe, you will need to choose a new satellite pair from the list of available European satellites (see Table 2-10). For details on installing these new satellites, refer to *Section 2.9, "Installing Satellites Using the ADCU"* on page 44.

Replace the IRD

In order to receive satellite TV service in your new geographic location, you will need to purchase an IRD designed for that location. Refer to your satellite TV service provider for more information.



You may also need to replace your television when changing geographic location. In North America, your TV must support the NTSC video standard. In Europe, your TV must support the PAL video standard.

3 — Using the ADCU Interface

This section explains how to use all of the ADCU functions. You will use the ADCU to operate, control, and monitor the TracVision G4 and GyroTrac.

Contents

3.1	Startup and Self-test	61
3.2	Data Display and Accessing the Main Menu	63
3.3	Setup Display Mode	67
3.4	Set Data Outputs Mode	68
3.5	Set Configuration Mode	73
3.6	Control Compass Mode	77
3.7	Antenna Status Mode	79
3.8	Control Antenna Mode	81

3.1 Startup and Self-test

1. Turn on the IRD and television.
2. If a GPS receiver is connected, ensure that it has obtained an accurate position.
3. Apply operating power to the ADCU.
4. Wait while the system conducts a brief self-test sequence. Test status messages are displayed on the ADCU for approximately two seconds each.

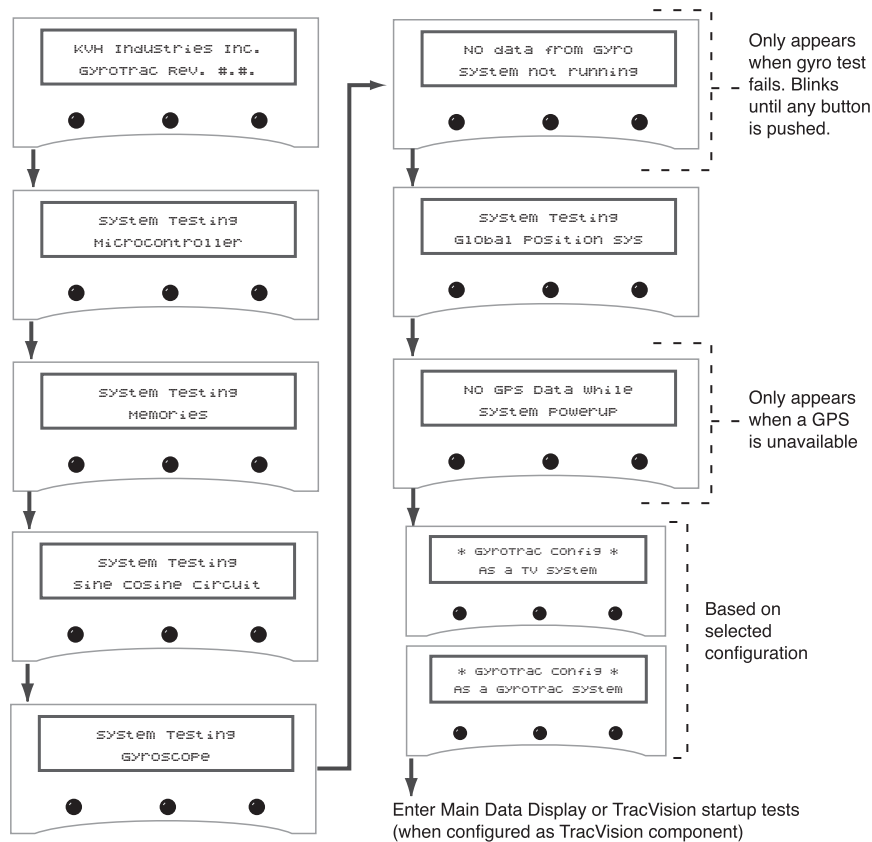


Figure 3-1

Startup and Self-test Sequence



The absence of valid GPS data is not a fault; the status message merely indicates that valid GPS data is not present and that those navigation functions that use GPS inputs are not available.

The GPS must be turned on first for TracVision G4 to use the GPS position data during initialization.

If the self-testing routine detects faults in any of the first four self-tests, the screen pictured in Figure 3-2 is displayed. Operation halts at this point and the GyroTrac cannot operate. The unit should be returned to your local authorized KVH dealer, distributor, or service center.

Figure 3-2

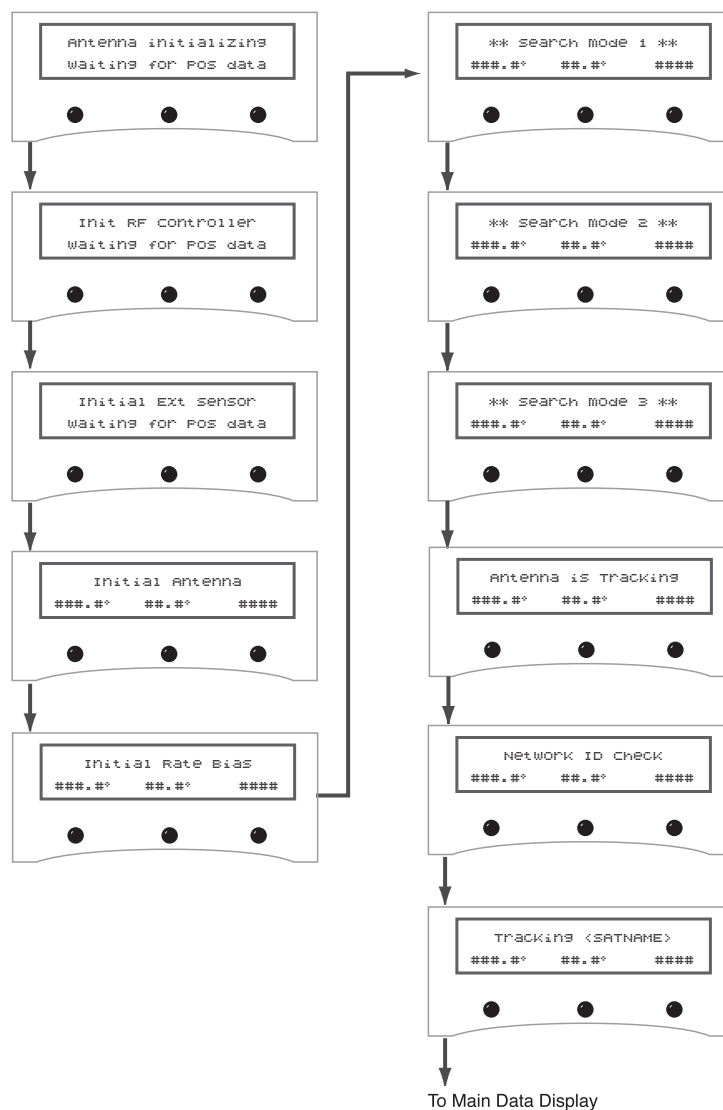
Startup Error Screen



TracVision Startup and Self-test Screens

When configured as a component of a TracVision system, GyroTrac conducts a series of startup routines and self-tests to verify antenna operation. The TracVision self-test status screens are *only* displayed when the main data display is set to show the antenna status information (as described in Section 3.3, “Setup Display Mode” on page 67.

Figure 3-3
TracVision G4 Startup Screens



3.2 Data Display and Accessing the Main Menu

As soon as the self-test routine is completed, the LCD panel shows one of five data displays selected in the Display Setup Mode (described in *Section 3.3, "Setup Display Mode" on page 67*). When any of the primary data displays are on screen, the soft keys allow you to switch between the two installed satellites as well as enter the Main Menu. The key functions and display options are as follows:

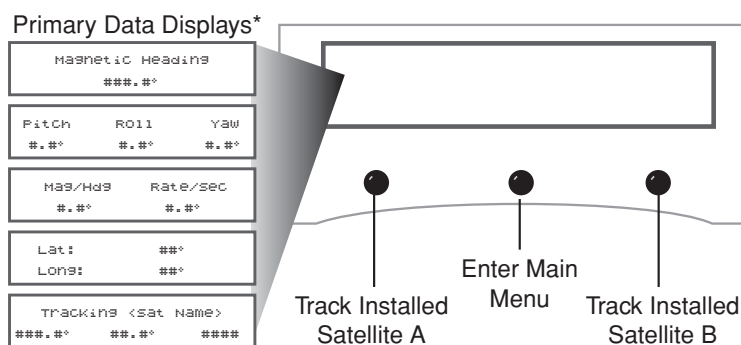


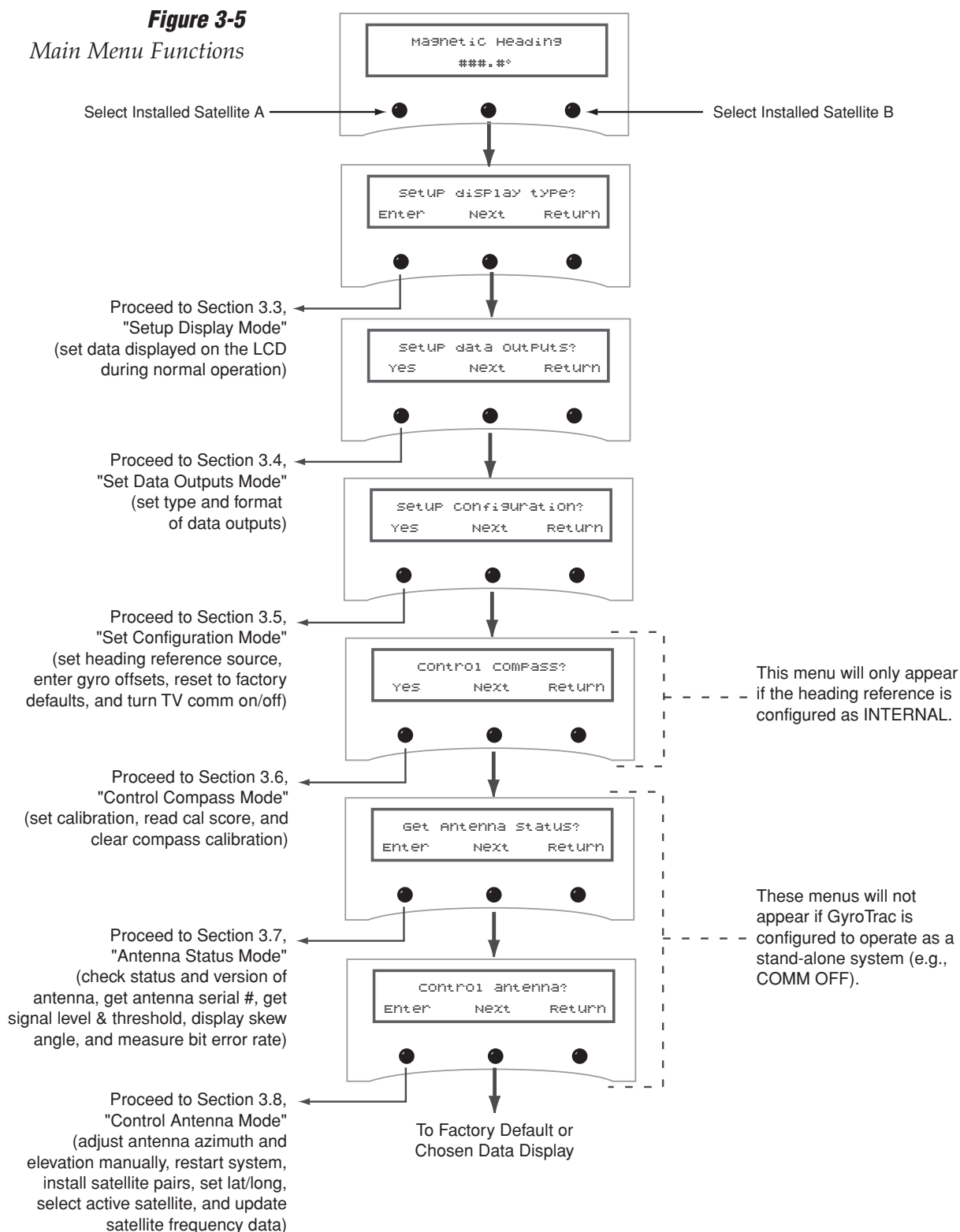
Figure 3-4

Soft Key Functions and Primary Data Displays

* Variations on these displays are also presented in Figure 3-9.

Main Menu

Pressing the center key will cycle the Main Menu through the available functions as follows:



Alert Screens

Certain operations require GyroTrac to temporarily cease its data output or alter its configuration so that new parameters or configurations may be entered. When you enter one of these functions, a pair of alert screens will appear, informing you of what will happen. Selecting “Yes” will allow you to continue into the function. Selecting “No” will return you to the Main Menu.

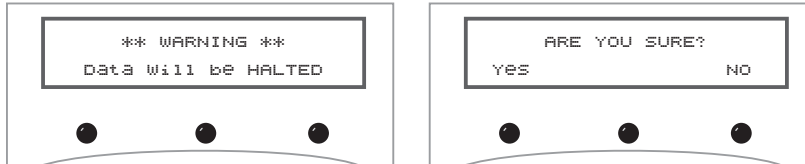


Figure 3-6
Sample Alert Screens

The RETURN and CANCEL Keys

Throughout the GyroTrac menus, the right-hand key will often be designated as either RETURN or CANCEL. These options have the following functions:

- **RETURN** – Returns to the main data display. If no keys are pressed within 10 seconds, the menu will automatically default to the main data display.
- **CANCEL** – Cancels current action and returns to the start of the action without making any changes.

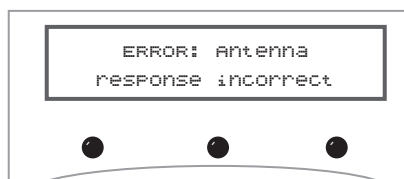
Antenna Error Messages

At times, the ADCU will display error messages alerting you to a specific problem (e.g., you have selected an invalid satellite pair). There are also two general antenna error messages that are not related to a specific action.

“Antenna response incorrect” (shown in Figure 3-7) indicates that the ADCU received an incorrect answer from the antenna in response to a request. The solution to this error is simply to repeat your requested operation.

Figure 3-7

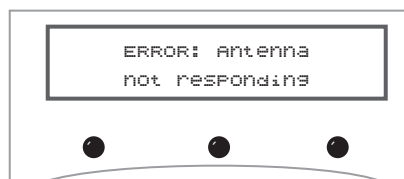
Incorrect Response Error Message



“Antenna not responding” (shown in Figure 3-8) indicates that no messages are being received from the antenna. This is usually the result of the antenna not being powered up or the antenna being disconnected from the ADCU.

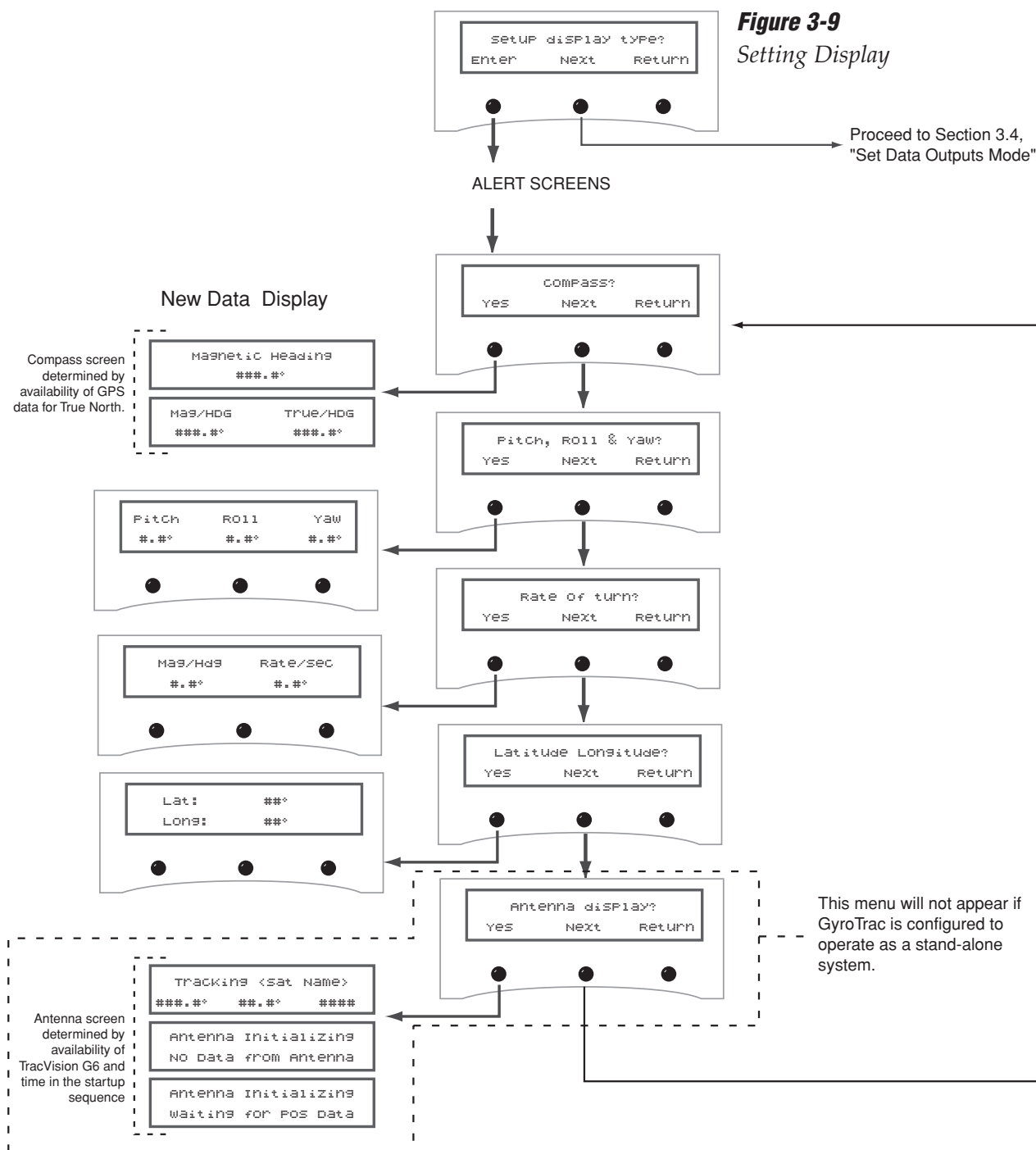
Figure 3-8

Non-responsive Antenna Error Message



3.3 Setup Display Mode

The Setup Display mode selects the data that will be displayed on the ADCU LCD after startup and self-test; it does not control the data sent to remote heading display units, north-up radars, autopilots, etc.





For more details about the available data outputs, refer to Appendix G, "GyroTrac Data Outputs" on page 145.

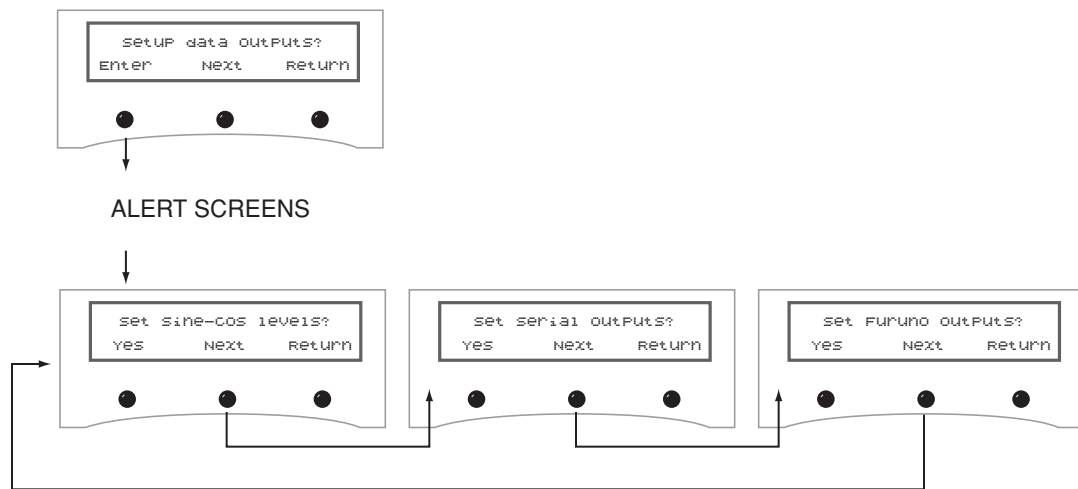
3.4 Set Data Outputs Mode

The Set Data Outputs function is used to select several types of data formats available from the GyroTrac. The message formats are as follows:

- 1 sine/cosine (either 4-wire or B&G 3-wire)
- 3 serial message formats:
 - NMEA 0183
 - KVH pitch, roll, and yaw
 - Cetrek
- 1 Furuno AD10S

These messages are output to displays and external navigation systems only if selected via the ADCU. Selection procedures are presented in the following sections.

Figure 3-10
Data Outputs Mode
Menu Sequence



Setting the Sine/Cosine Data Output

The sine/cosine setup is done in three stages: first the magnetic or true heading option is selected, then the reference voltage is set, and finally the swing voltage is set. The valid range for reference and swing voltages is between 0 and 6.5 volts. The default value for reference voltage is 2.5 volts. The default value for swing voltage is ± 1.67 volts. Refer to your autopilot manual for correct voltage requirements.

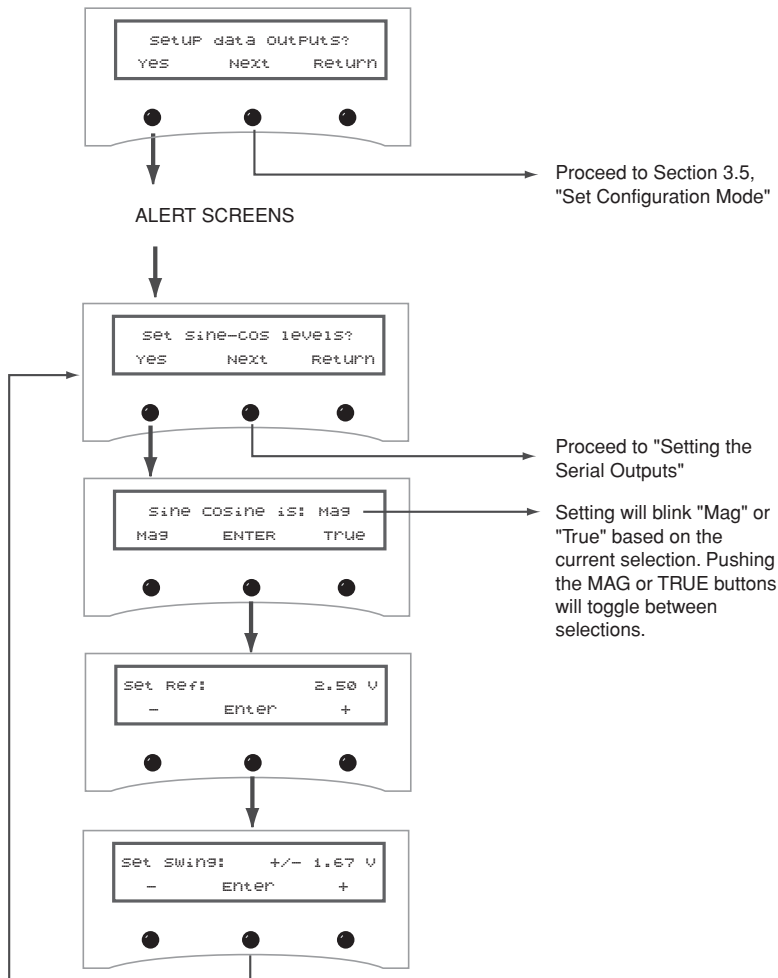
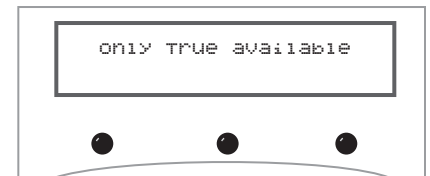


Figure 3-11

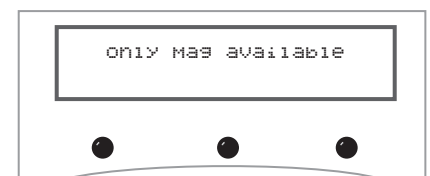
Setting Sine/Cosine Data Output



If the GyroTrac is receiving data from a ship's gyro, all compass outputs are automatically configured as True North and cannot be set to Magnetic. If this is the case, the following variation on the magnetic/true selection screen will be displayed:



If the system is NOT connected to a GPS or a ship's gyro, only magnetic heading data will be available and the following variation on the magnetic/true selection screen will be displayed:

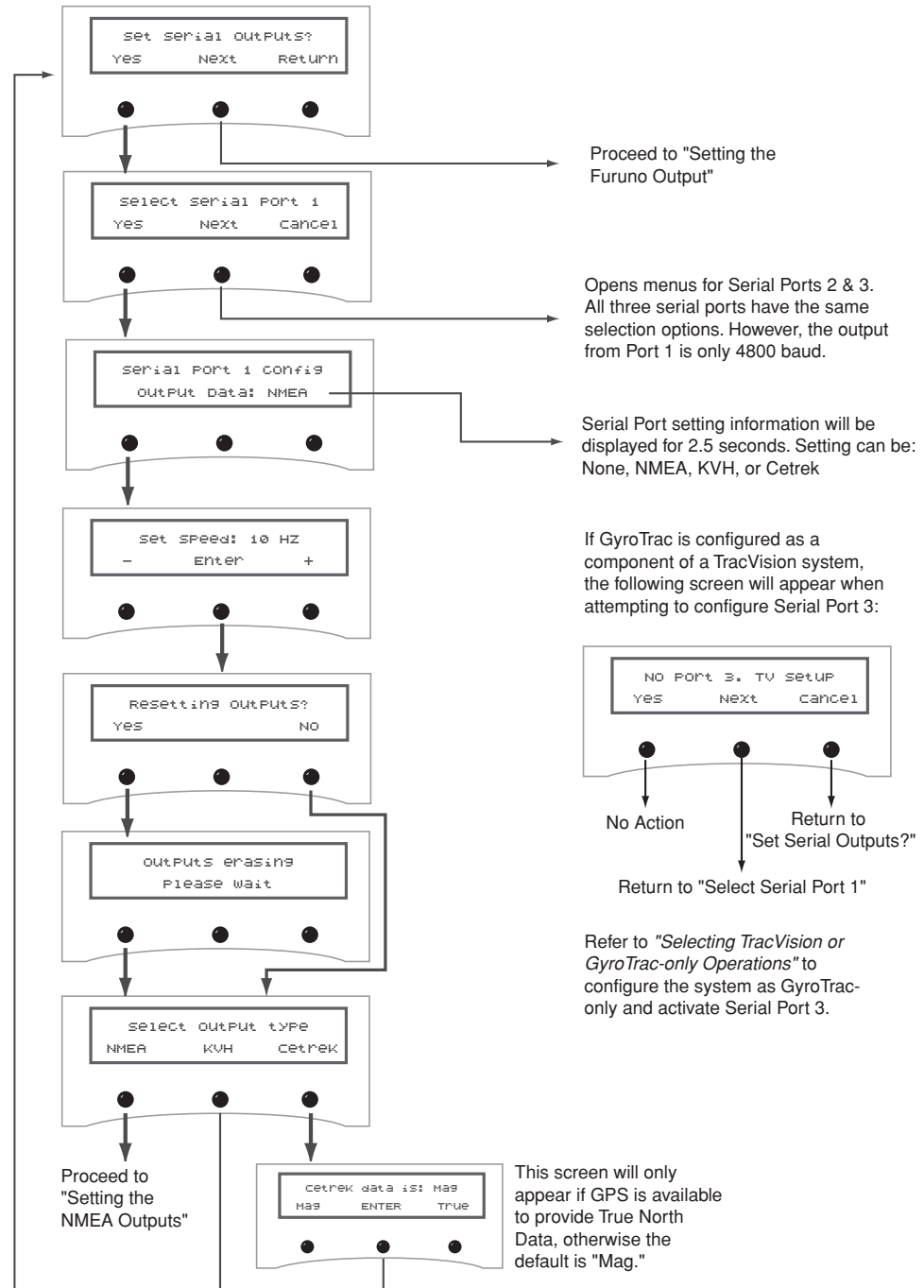


The system will then proceed to the "Set Ref" screen.

Setting the Serial Outputs

The GyroTrac can output as many as three serial messages simultaneously in any combination of NMEA version 2.2, KVH RS-422, or Cetrek proprietary format. NMEA message options and the KVH and Cetrek formats are described briefly in *Appendix G on page 145*. Follow the procedures illustrated below to set the serial outputs. The factory default speed setting is 10 Hz.

Figure 3-12
Setting Serial Outputs



Setting the NMEA Outputs

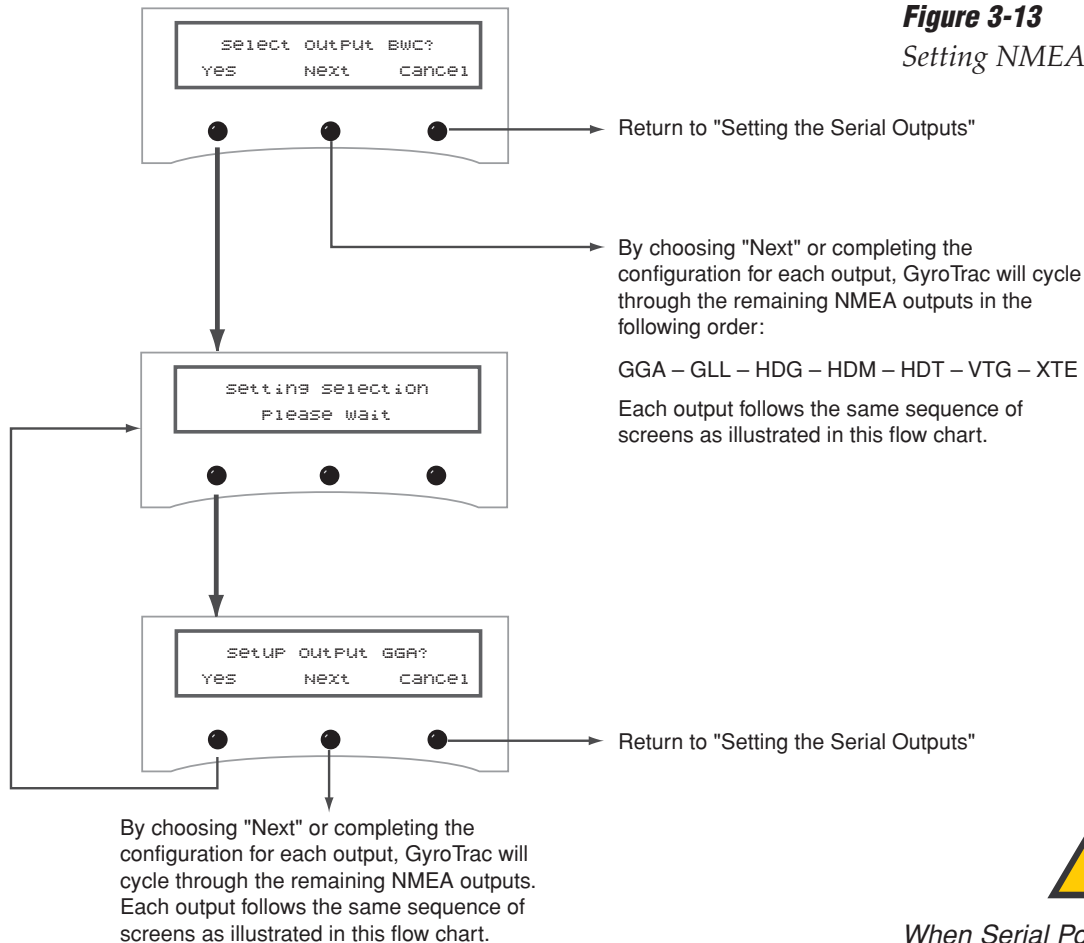
GyroTrac is fully compatible with NMEA *input* versions 1.5 and 2.2. However, the individual serial ports can only be programmed to use NMEA version 2.2 as an *output*.



Custom configurations are not available on GyroTrac.

Figure 3-13

Setting NMEA Outputs



When Serial Ports 2 or 3 are selected to provide NMEA output, the baud rate is automatically changed to 4800 baud from the default of 9600 baud. Serial Port 1 and its pass-through duplicate only provide 4800 baud output.

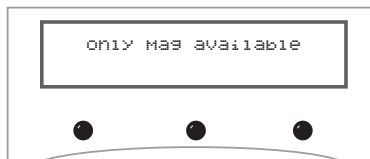
Setting the Furuno Output

This option selects two available options for the Furuno output: magnetic or true heading reference and 25 millisecond or 200 millisecond data output rate.

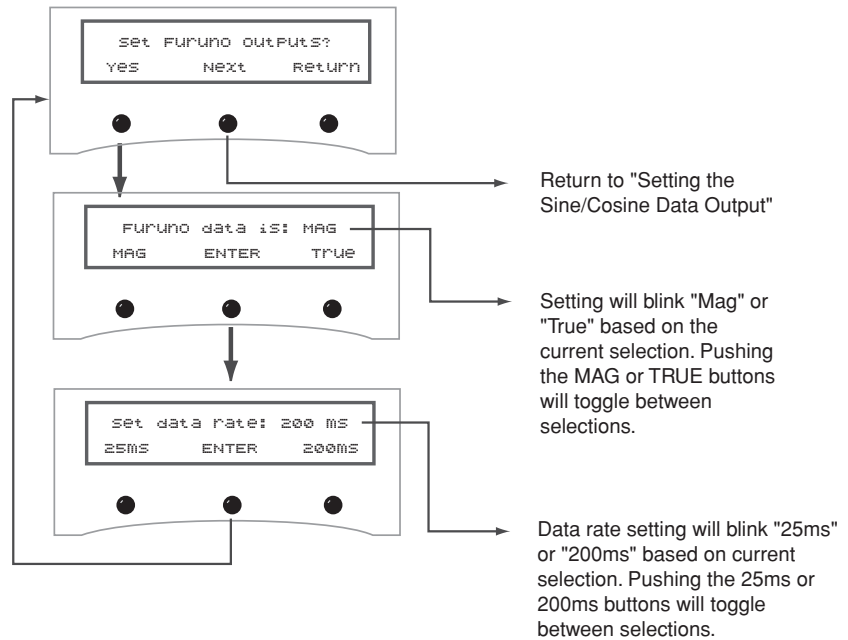
Figure 3-14
Setting Furuno Output



If the system is NOT connected to a GPS or a ship's gyro, only magnetic heading data will be available and the following variation on the magnetic/true selection screen will be displayed:



The system will then proceed to the "Set Data Rate" screen.



3.5 Set Configuration Mode

The Set Configuration function is used to set the display brightness, select an internal or external source for heading data, enter offset values that correct for mechanical mounting alignment errors, reset the system to its factory defaults, and turn TV communications on/off.

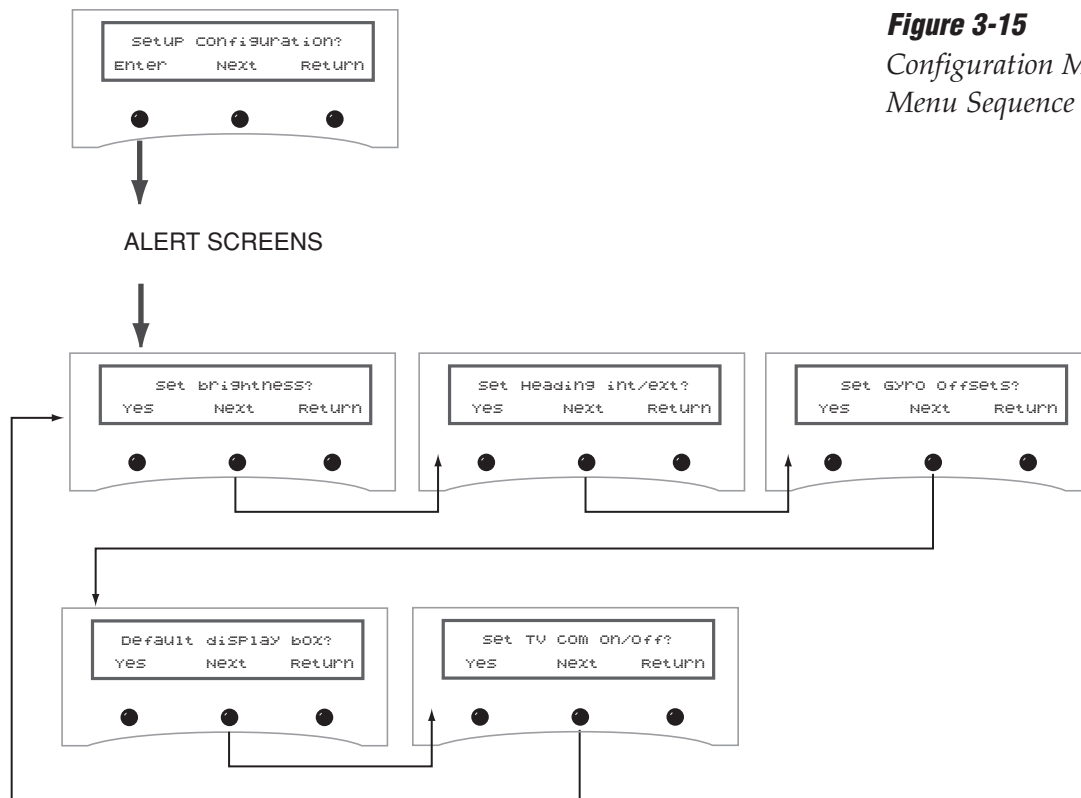
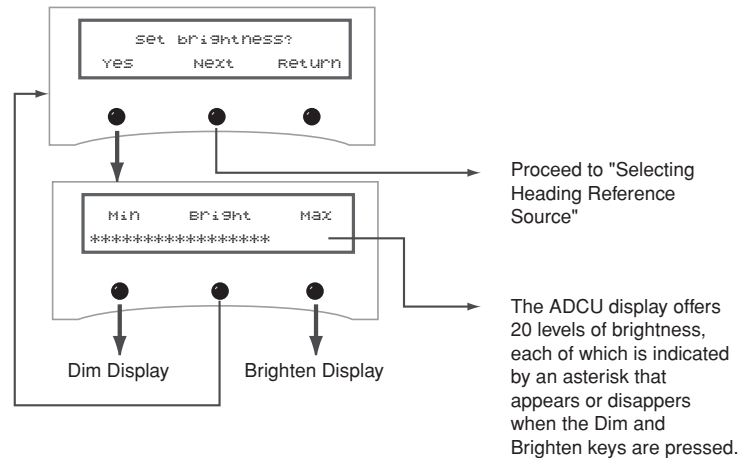


Figure 3-15
Configuration Mode
Menu Sequence

Setting Display Brightness

The ADCU display's brightness may be adjusted to suit your preferences. Press the right key to make the display brighter, the left key to make it dimmer. When you are satisfied with the setting, press the center key to accept the setting.

Figure 3-16
Display Brightness Controls

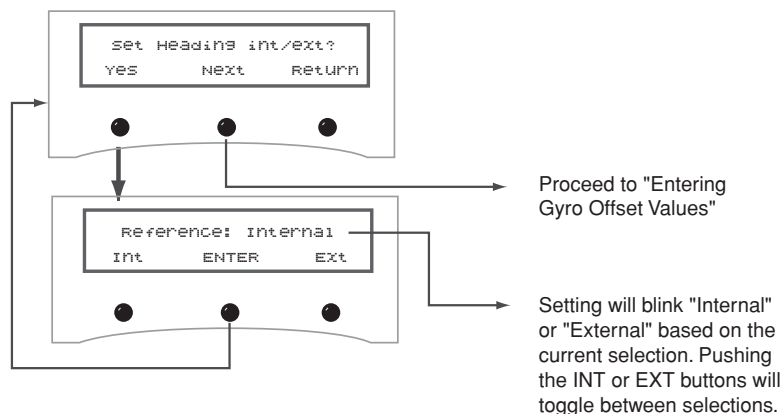


Selecting Heading Reference Source

The Heading Reference Source menu provides the option to override the GyroTrac's external sensor module in favor of another source, such as a ship's gyro, as follows:

- **INTERNAL** – GyroTrac will receive and use heading data from its sensor module. The Control Compass menus will be available.
- **EXTERNAL** – GyroTrac will receive and use heading data from an external heading source. As a result, the Control Compass menus will be inactive and hidden. Refer to Figure 2-21 on page 30 for details on connecting a ship's gyro to the ADCU.

Figure 3-17
Internal/External Reference Menus



Entering Gyro Offset Values

The sensor module housing must be mounted as close to level in pitch and roll as possible, with its long axis parallel to the vessel's centerline. Sometimes allowances must be made for the particular installation where pitch, roll, and azimuth references cannot be met. The offset values adjust for this. The allowable offset values for pitch and roll are $\pm 45^\circ$; the offset for azimuth can be up to $\pm 180^\circ$. Once entered, offset values will not need to be changed unless the sensor module is relocated.

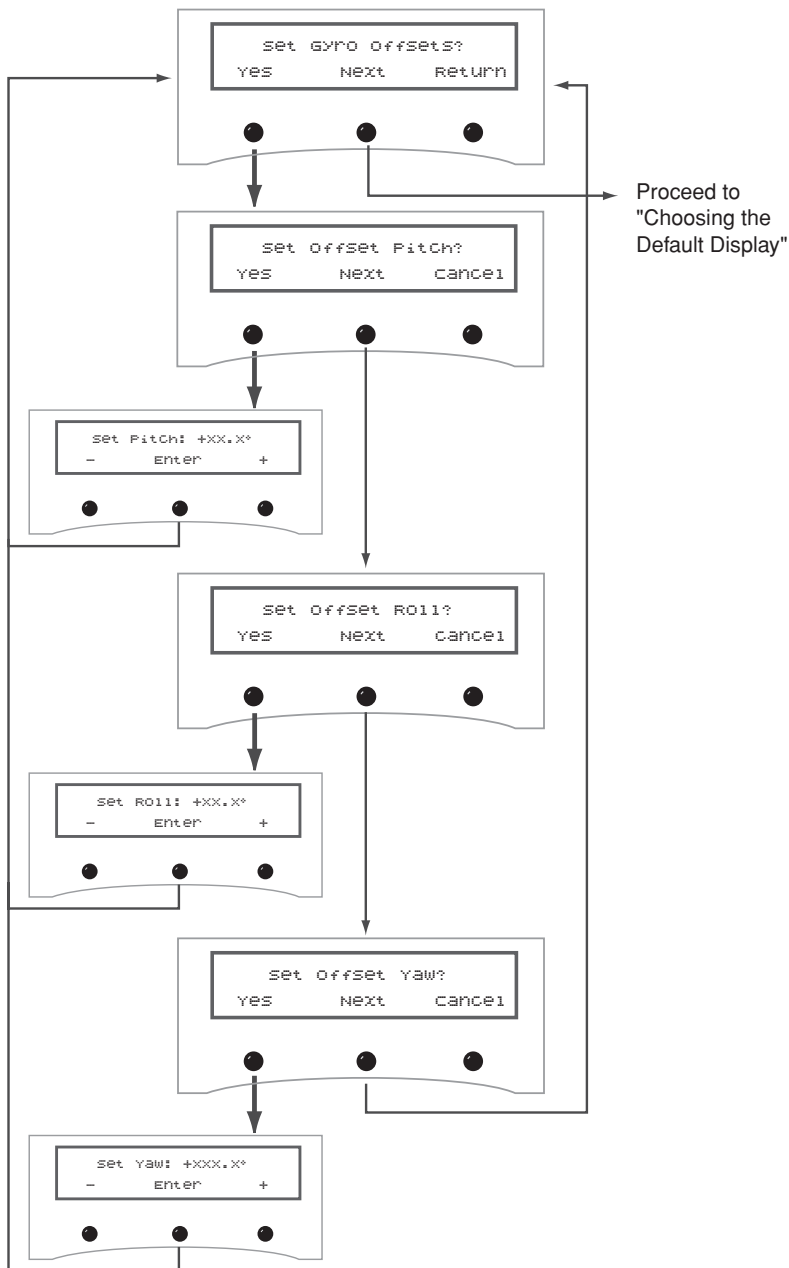


Figure 3-18

Entering Gyro Offset Values



Pitch, roll, and yaw settings are determined by the sensor module's internal inclinometer, not external measurements.

To set pitch, roll, and yaw properly, initially enter zeros for all measurements. Choose the Pitch, Roll, and Yaw display from the Main Menu and record those numbers.

Reverse the value of the Pitch and Roll (positive becomes negative, negative becomes positive).

Return to the Gyro Offset menu and enter the recorded numbers.

This process should be carried out in still water or at the dock.

As noted in Section 2.3, "Mounting the GyroTrac Sensor" on page 19, the sensor must be aligned to within $\pm 5^\circ$ of the vessel's fore-and-aft centerline. Deviation beyond $\pm 5^\circ$ will degrade pitch, roll, and yaw accuracy.

Choosing the Default Display

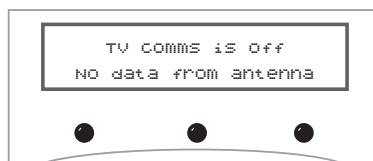
This option resets the ADCU display settings to their factory defaults (i.e., compass, 50 percent brightness).

Figure 3-19

Selecting the Default Display



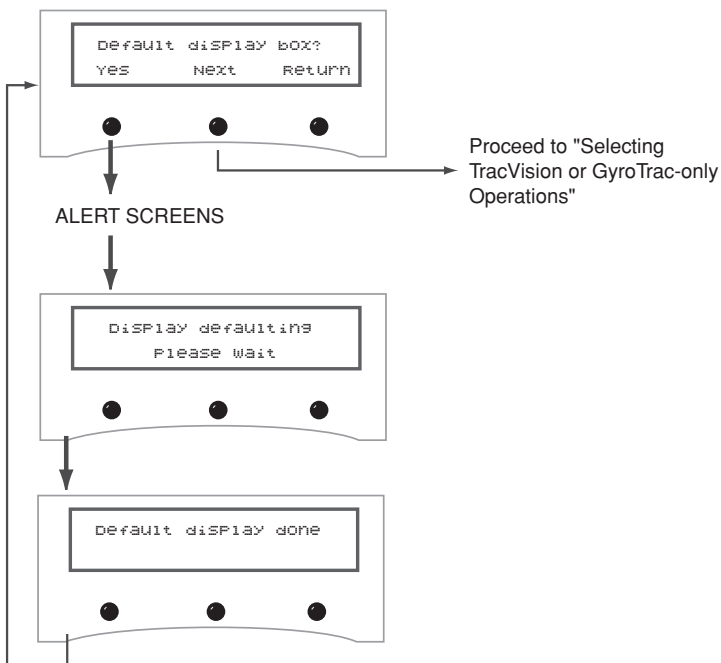
If the main display is set to show antenna tracking information but the antenna communications are OFF, the following display will be shown:



To correct the error, turn antenna communications ON or change the main display setting.

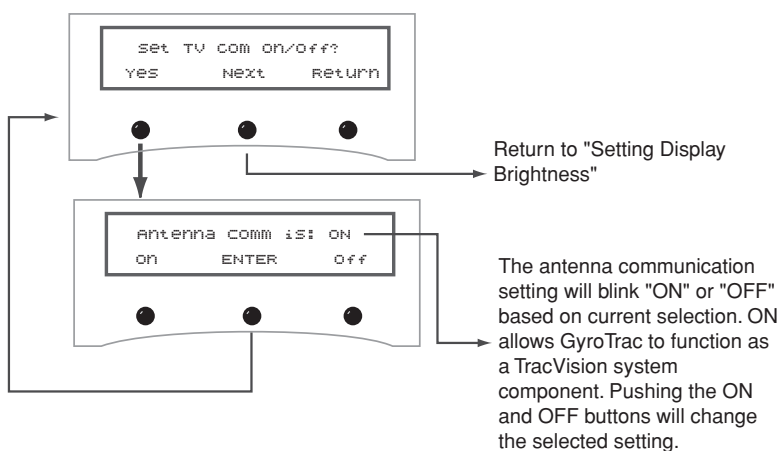
Figure 3-20

Selecting TracVision or GyroTrac-only Operations



Selecting TracVision or GyroTrac-only Operations

GyroTrac's factory default configuration is to operate as a stand-alone system (**Antenna Comm: OFF**). Connecting a TracVision antenna will reconfigure GyroTrac to function as a component of a TracVision system (**Antenna Comm: ON**).



3.6 Control Compass Mode

These screens are only seen if heading reference is INTERNAL.

The Control Compass function provides control over the GyroTrac sensor module, including turning autocalibration on and off, reading the calibration score, and manually clearing the compass calibration.

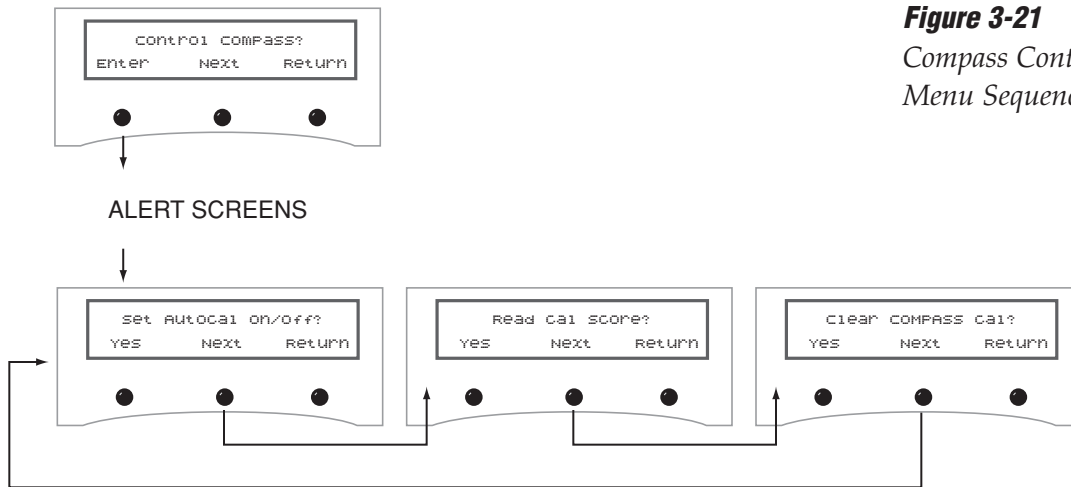


Figure 3-21
Compass Control Mode
Menu Sequence

Selecting Autocalibration

These screens are only seen if heading reference is INTERNAL.

GyroTrac is fully capable of autocalibration to ensure that the navigation data is as accurate as possible.

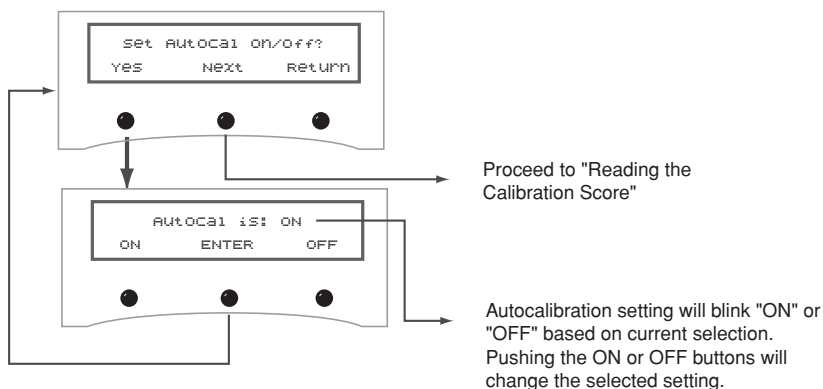


Figure 3-22
Setting Autocalibration



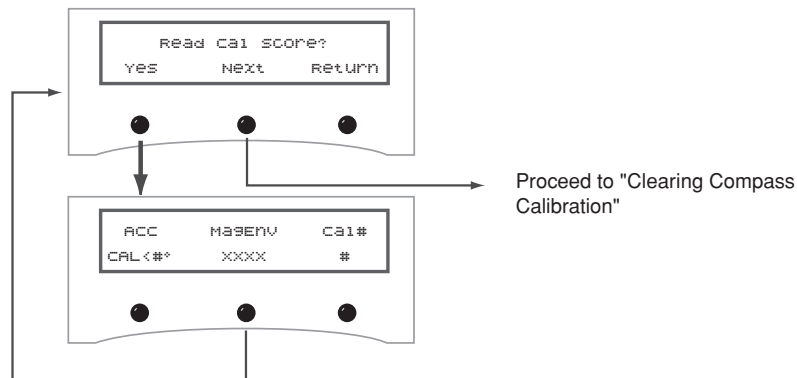
A well-calibrated sensor is crucial to GyroTrac's accuracy. If you shift, remove, or add equipment near the sensor, KVH suggests turning autocalibration on so that the sensor will automatically recalibrate itself.

Reading the Calibration Score

These screens are only seen if heading reference is INTERNAL.

The calibration score should be checked during the installation process and whenever adjustments are made to vessel equipment that can affect the compass' accuracy. A complete explanation of the calibration score is provided in "The Calibration Score" on page 41.

Figure 3-23
Reading Calibration Score



Clearing Compass Calibration

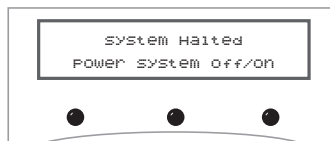
These screens are only seen if heading reference is INTERNAL.

Clearing the compass calibration will reset the system to the factory defaults.

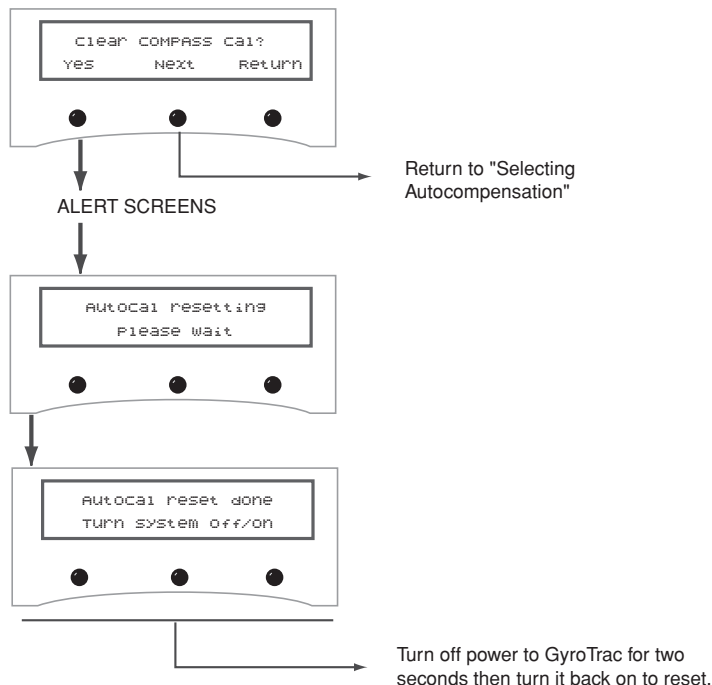
Figure 3-24
Clearing Compass Calibration



After resetting this autocalibration, the following screen may appear:



This may result from a temporary lack of communication with the compass. Restart the system to restore compass data.



3.7 Antenna Status Mode

These screens are only seen if Antenna Comm is turned ON.

This sequence of steps allows a user to scan for system errors, access antenna type, version, and serial number information, check the signal and noise levels, indicate the skew angle, and display the bit error rate.

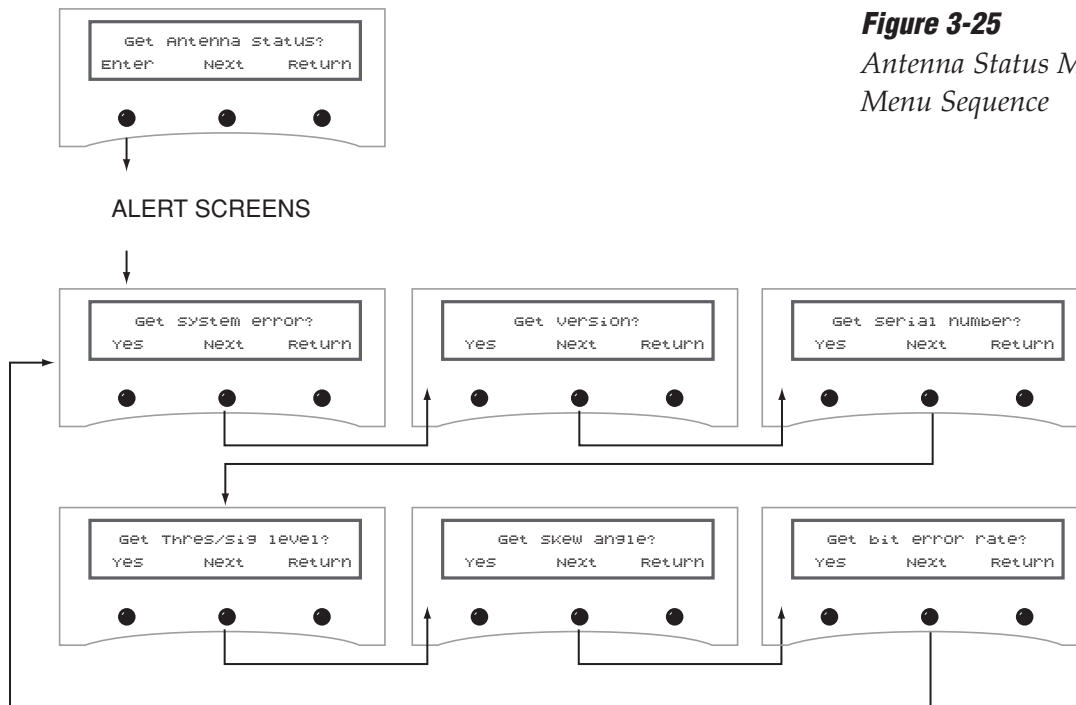


Figure 3-25

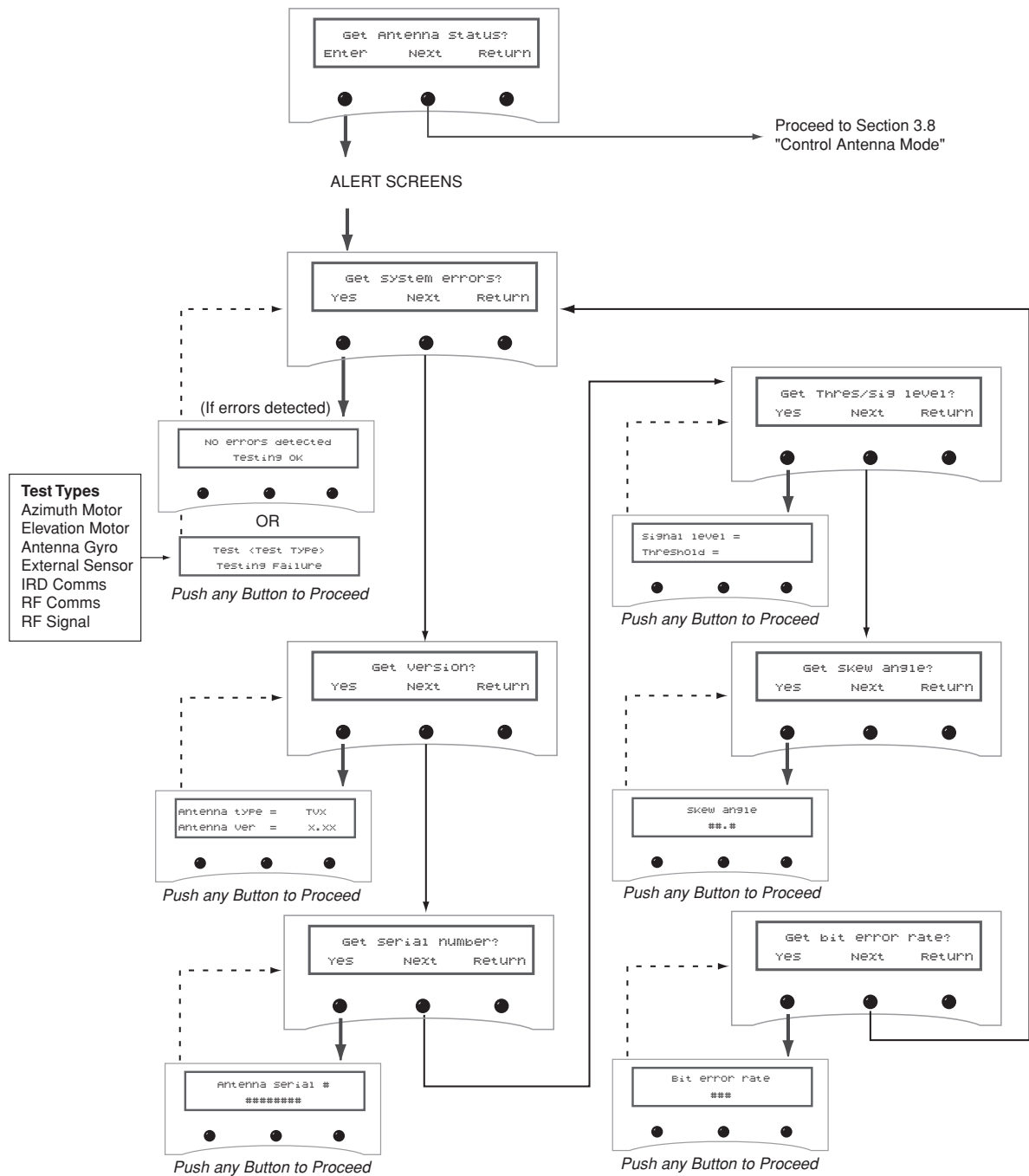
*Antenna Status Mode
Menu Sequence*

Antenna Status Data Screens

These screens are only seen if Antenna Comm is turned ON.

Figure 3-26
Antenna Status Data Screens

Figure 3-26 shows the information available through the Get Antenna Status mode. The Skew Angle and Bit Error rates are only available when the GyroTrac ADCU is connected to a TracVision G4.



3.8 Control Antenna Mode

These screens are only seen if Antenna Comm is turned ON.

This sequence of steps allows a user to adjust the antenna's azimuth and elevation manually, restart the antenna, turn Sleep Mode on/off, turn Instant On Mode on/off, install a new pair of active satellites, set the latitude and longitude, select the active satellite system, and update satellite frequency data.

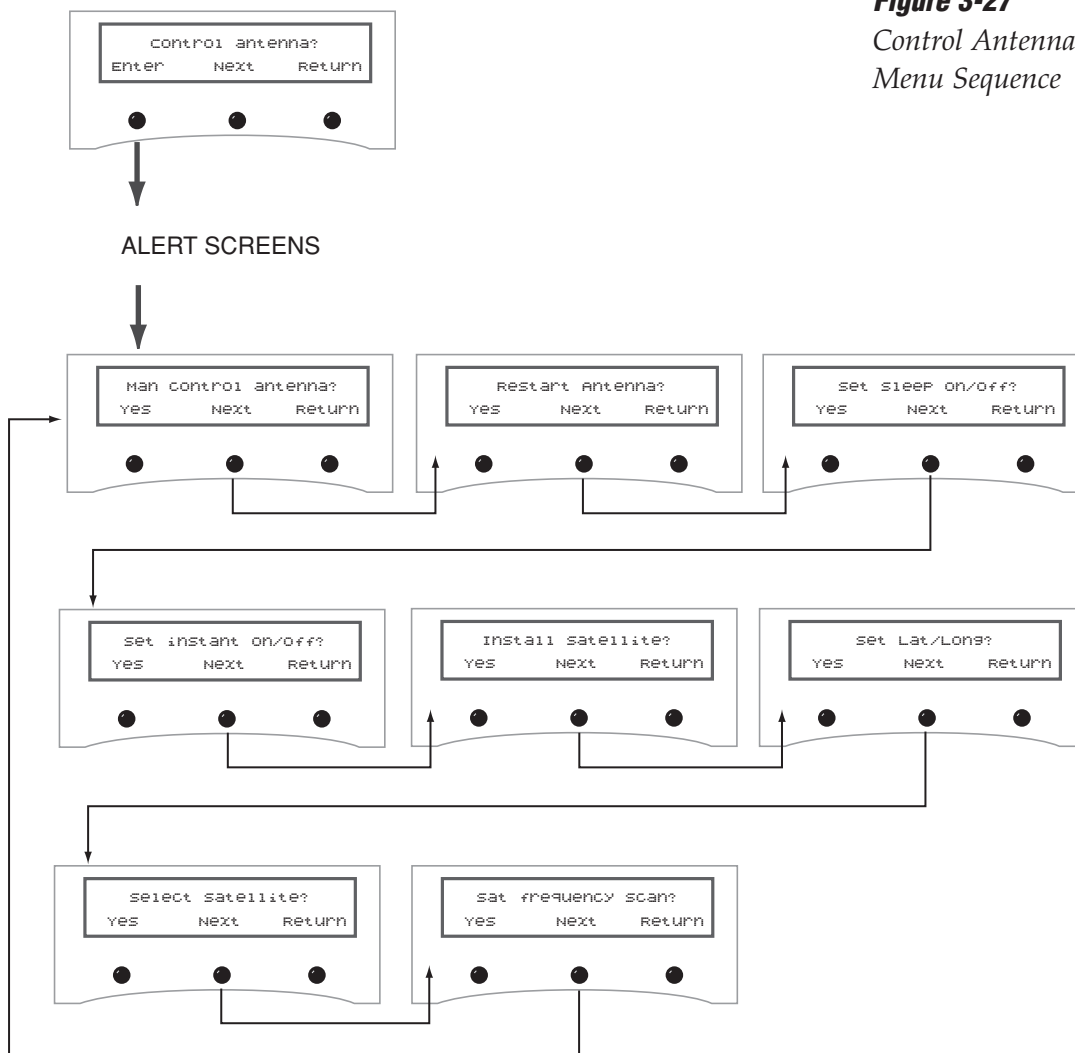


Figure 3-27

*Control Antenna Mode
Menu Sequence*

Manually Controlling the Antenna

In certain circumstances, you may need to control the azimuth, elevation, and tracking of the TracVision G4 antenna manually, using the process shown in Figure 3-28. Use the + and - keys to manually move the dish. Azimuth measurements are reported as relative to the bearing of the vessel's bow.

Figure 3-28

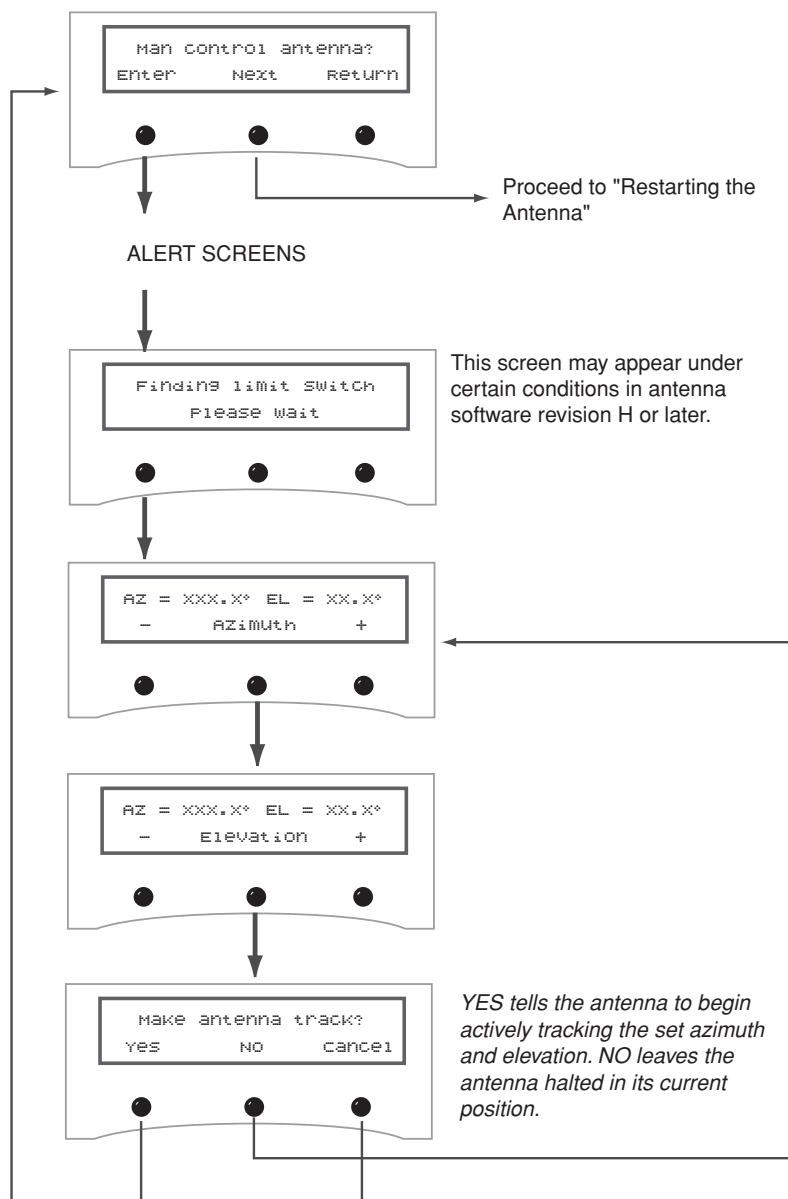
Manual Antenna Control Procedure



If the manual adjustment of the antenna reached the maximum rotation (720°), the antenna will rotate 360° and return to the Manual Control Antenna screens.



If the system started up in Instant On mode, the following message may be displayed:



Restarting the Antenna

After resetting satellite parameters, it is necessary to restart the antenna before the new settings take effect.

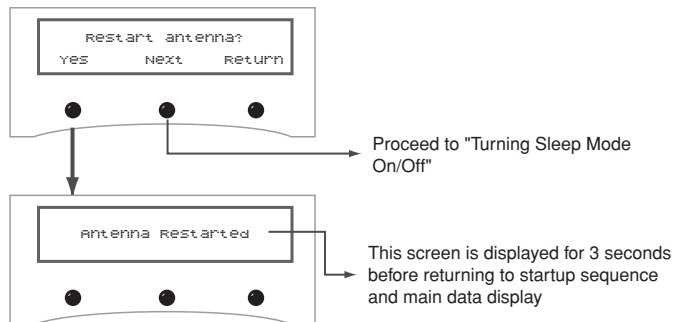


Figure 3-29

Restart Antenna Menu

Turning Sleep Mode On/Off

Sleep Mode turns off conical scan tracking if the antenna holds the same position for one minute. As soon as the vessel moves, the system will automatically begin tracking the satellite again.

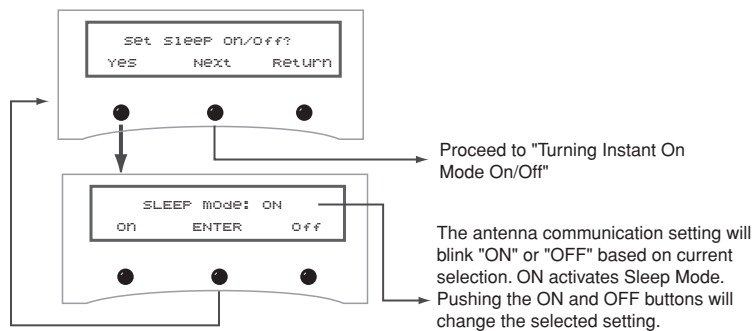


Figure 3-30

Sleep Mode Menu



The factory default setting for Sleep Mode is ON.

Turning Instant On Mode On/Off

Instant On allows the antenna to immediately receive a TV signal if the vessel has not moved since the antenna was last shut off. If the vessel moves after acquiring the satellite via Instant On, the antenna will undergo its standard initialization process, resulting in a brief interruption of the TV signal.

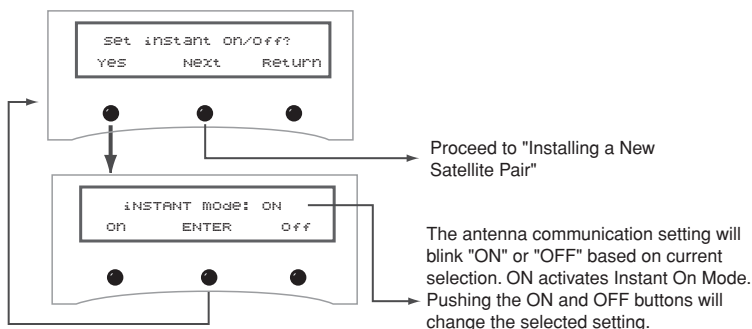


Figure 3-31

Instant On Mode Menu



The factory default setting for Instant On Mode is ON.

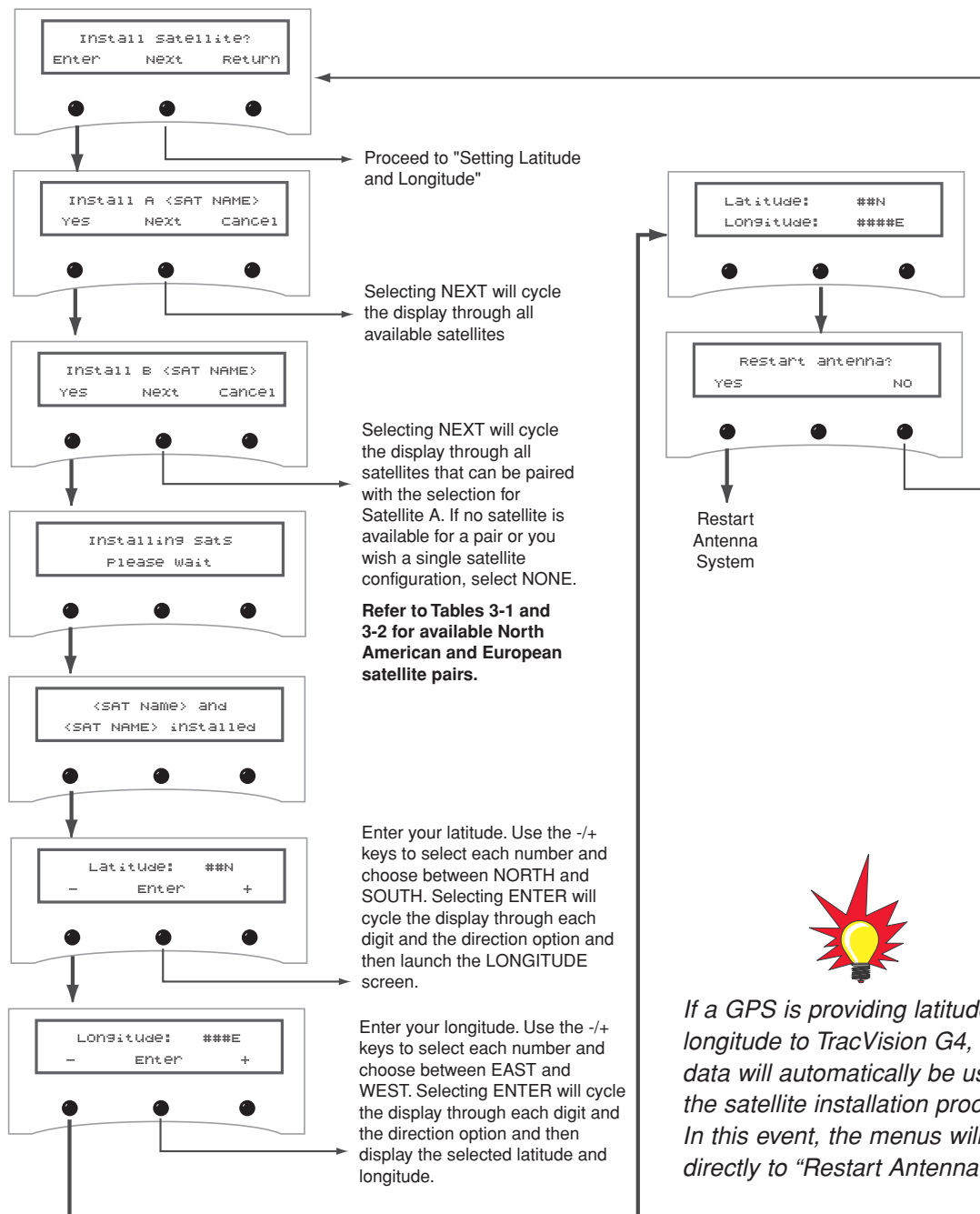
Installing a New Satellite Pair

These screens are only seen if the GyroTrac ADCU is connected to a TracVision G4.

TracVision G4 permits two satellite services (Satellites A and B) to be installed simultaneously. There is also an option for **NONE** on Satellite B, permitting single satellite operation.

Figure 3-32

Install Satellite Pair Process



If a GPS is providing latitude and longitude to TracVision G4, this data will automatically be used in the satellite installation procedure. In this event, the menus will skip directly to "Restart Antenna."

Table 3-1*Available Satellite Pairs**- North America**(North American LNB required)*

	DSS_101	DSS_119	Echo_61	Echo_110	Echo_119	Echo_148	Expressvu	ExpressTV
DSS_101		✓					✓	✓
DSS_119	✓						✓	✓
Echo_61				✓	✓		✓	✓
Echo_110			✓		✓	✓	✓	✓
Echo_119			✓	✓		✓	✓	✓
Echo_148				✓	✓		✓	✓
Expressvu	✓	✓	✓	✓	✓	✓		✓
ExpressTV	✓	✓	✓	✓	✓	✓	✓	

Table 3-2*Available Satellite Pairs - Europe**(European LNB required)*

	Astra 1	Astra 2N	Astra 2S	Hispasat	Hotbird	Sirius	Thor
Astra 1		✓	✓		✓	✓	
Astra 2N	✓				✓		
Astra 2S	✓				✓		
Hispasat							
Hotbird	✓	✓	✓			✓	
Sirius	✓				✓		✓
Thor						✓	

Setting Latitude and Longitude

These screens are only seen if the GyroTrac ADCU is connected to a TracVision G4.

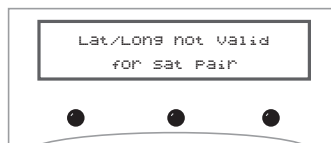
When installing a satellite pair, it is also necessary to enter the vessel's latitude and longitude to ensure that the installed satellites are viewable as well as to permit the system to set several internal parameters.

Figure 3-33

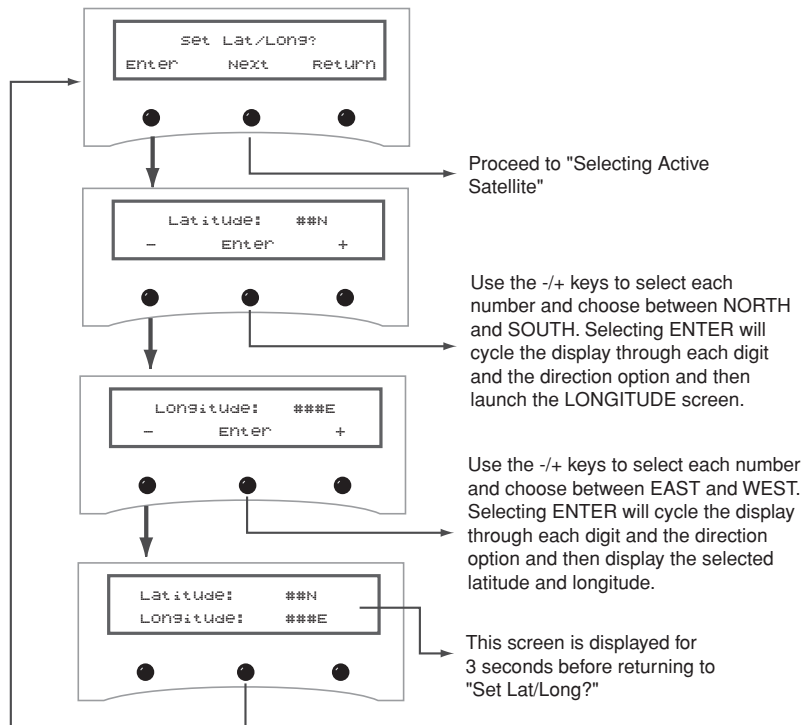
Set Latitude/Longitude Procedure



If the latitude and/or longitude entered is not valid for the installed satellite pair, the following screen will appear:



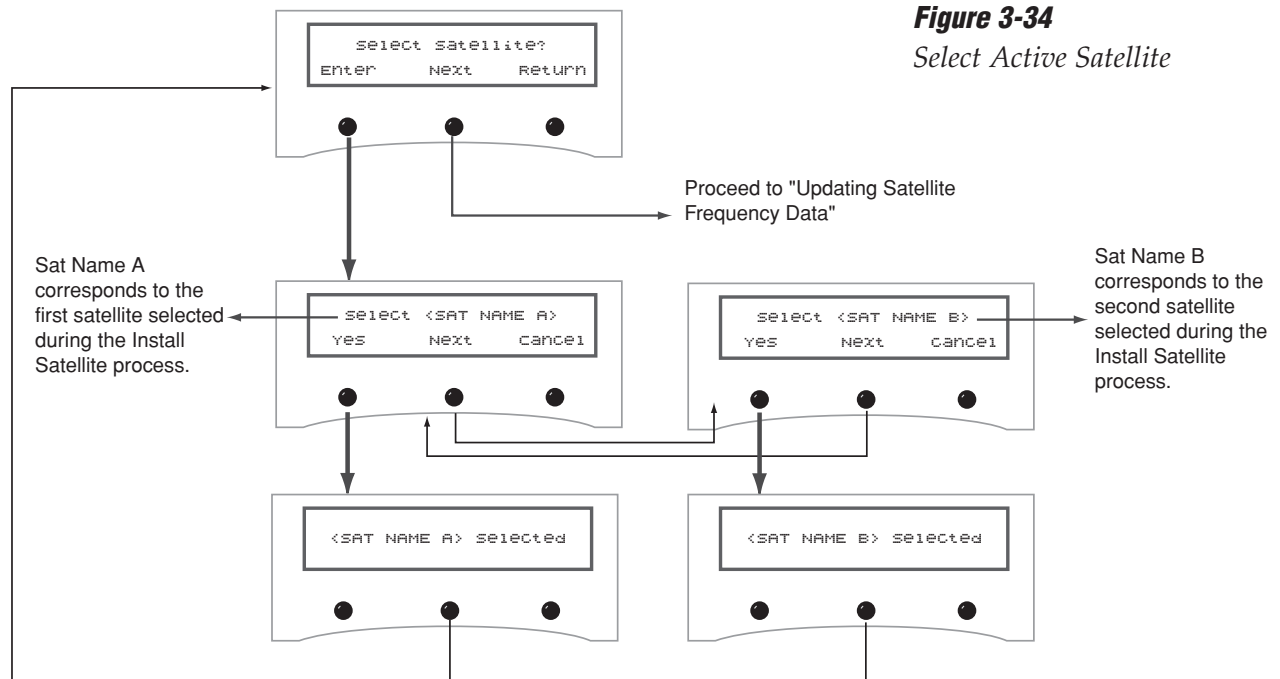
Recheck and re-enter your latitude and longitude and verify your installed satellite pair to resolve this issue.



Selecting Active Satellite

These screens are only seen if the GyroTrac ADCU is connected to a TracVision G4.

After installing the active pair of satellites, use the Select Satellite menu to choose which of the installed satellites will be active.





Do **NOT** use this function unless directed by KVH Technical Support or a KVH-authorized technician. Improper data selection may affect the system's operation.

Updating Satellite Frequency Data

If the antenna is unable to find a satellite, the satellite's frequency data may have changed. The Satellite Frequency Scan feature allows you to update the frequency data of any satellite stored in the system's library.

This function should not be used unless directed by KVH Technical Support or a KVH-authorized technician.

With the desired satellite, band, and polarization selected, the system will automatically search for the frequency with the strongest signal. The system will then update that satellite's programmed data with the new frequency (and associated network ID) and store it in the satellite library.

To update the satellite frequency data, follow the steps below:

1. Place your IRD in the satellite signal meter mode.
2. Select the desired satellite on the ADCU. *Ensure the TV signal meter indicates that you have a strong signal.*

If the antenna is unable to find the selected satellite automatically, you can manually point the antenna using the Manual mode (see "Manually Controlling the Antenna" on page 82).

3. Select the desired polarization and band on the IRD.
4. *Do not move the vessel.* Your boat must remain motionless during the entire Satellite Frequency Scan process.
5. Follow the ADCU menus on the next page. The scan itself will take a couple of minutes. Once complete, restart the antenna and ensure the antenna will track the new frequency.

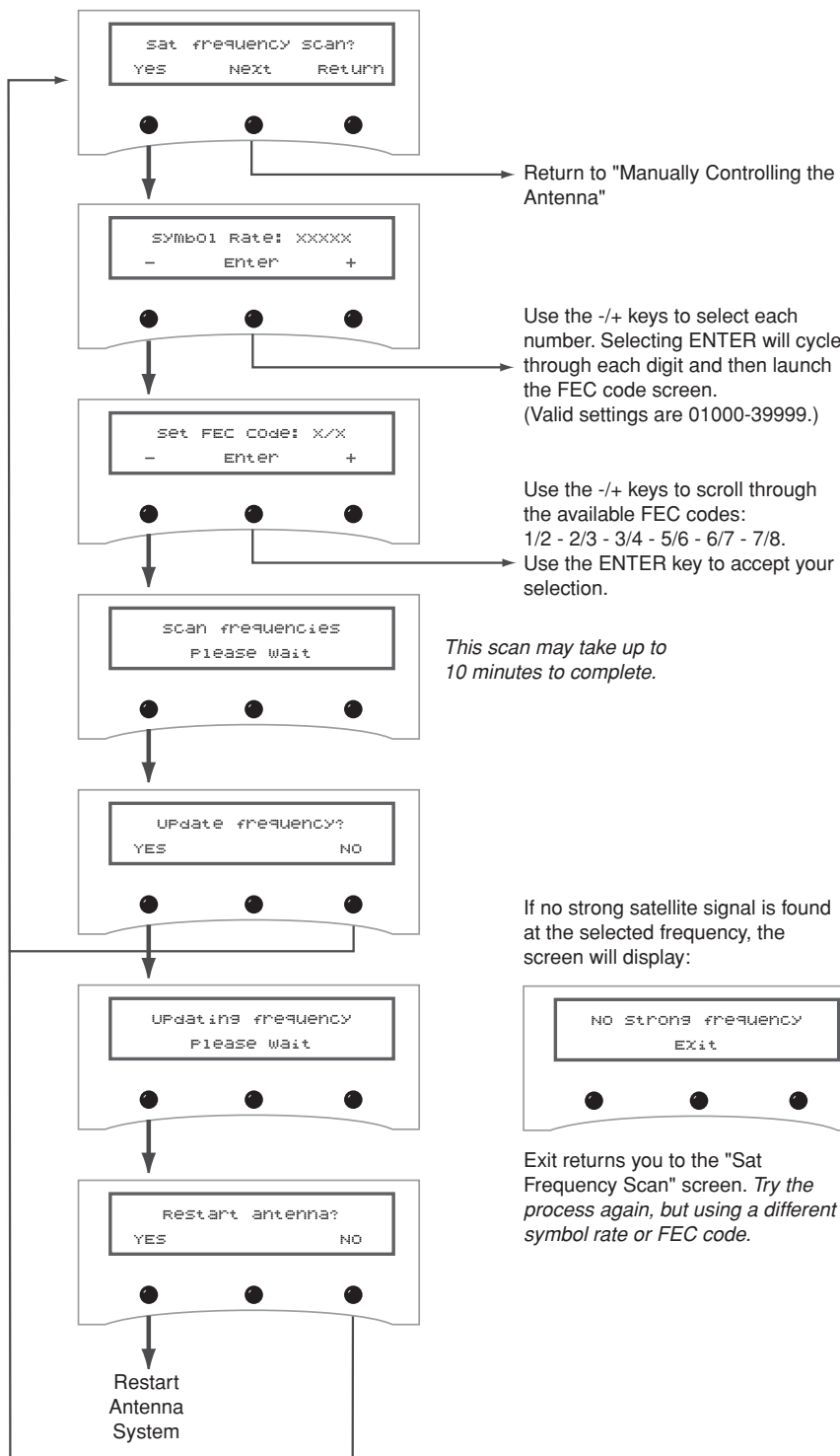


Figure 3-35
Satellite Frequency Scan

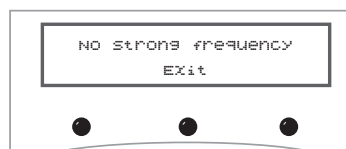


To find a valid symbol rate and FEC code, refer to an up-to-date satellite table either in a magazine or on the Internet. For your convenience, this data is available (for the system's predefined satellites) on our web site at www.kvh.com/footprint.



The vessel must remain stationary during this process.

If no strong satellite signal is found at the selected frequency, the screen will display:



Exit returns you to the "Sat Frequency Scan" screen. Try the process again, but using a different symbol rate or FEC code.

4 — Troubleshooting

This section identifies basic trouble symptoms and lists their possible causes and solutions.

Contents

4.1	Troubleshooting Matrix	93
4.2	Causes and Remedies for Common Operational Issues	94
4.3	GyroTrac-specific Issues	97
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4.5	Antenna Gyro and LNB Faults	98
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4.1 Troubleshooting Matrix

The troubleshooting matrix shown in Table 4-1 identifies some trouble symptoms, their possible causes, and references to troubleshooting solutions.

Table 4-1
Troubleshooting Matrix

SYMPTOM	Section 4.2												
	POSSIBLE CAUSE (AND SOLUTION)	Blown fuse, low power, or improper wiring	Vessel turning during startup	Incorrect satellite configuration	Satellite signal blocked	Satellite coverage issue	Radar interference	Satellite frequency data changed	Type of loose RF connectors	GyroTrac-specific issues (Section 4.3)	IRD faulty or improperly configured (Section 4.4)	Antenna gyro faulty (Section 4.5)	LNB assembly faulty (Section 4.5)
Antenna non-functional	1												
Antenna not switching satellites	1		1	1	1			2	2		2		2
No picture on TV set				1	1	2		2	2		2		2
Certain channels do not work	1			1	1		3	2			2		2
Intermittent picture for short intervals		1		1	1	2		2	2			3	2
System works at dock but not on the move				1						3		3	
System will not find satellite	1	1	1	1	1	2	3	2	2	3	2	3	2
Snowy television picture	1							2			2		
Pixelating television picture	1			1		2		2			2	3	2
No antenna-specific menus on GyroTrac										3			
Antenna and GyroTrac not communicating	1									3			
No data output through Serial Port 3										3			

Key

1 = Anyone can do

2 = Electronics know-how recommended

3 = Dealer service recommended

4.2 Causes and Remedies for Common Operational Issues

There are a number of common issues that can affect the performance of the TracVision G4. The following sections address these issues and potential solutions.

Blown Fuse, Low Power, or Improper Wiring

Blown Fuse

The antenna unit is equipped with two fuses mounted on its main printed circuit board (PCB). The ADCU is equipped with one fuse mounted on its upper PCB. If any of these fuses has blown or been broken, the system will not work. For details on replacing an antenna unit fuse, refer to *Section 5.4, "Replacing the Main PCB and Fuses" on page 106*. For details on replacing the ADCU fuse, refer to *Section 4.3, "GyroTrac-specific Issues" on page 97*.

Low Power

If the power cable from the antenna unit to the power source or ADCU is more than 50 ft (15 m) long, the power level can decrease over the course of the cable, resulting in a voltage level at the antenna unit that is too low to power the system. Refer to *"Connecting the ADCU to Vessel Power" on page 37* for details on supplying adequate power to the antenna unit.

Wiring

If the system has been improperly wired, the antenna unit will not operate correctly. Refer to *Section 2.6, "Wiring the ADCU" on page 29* for complete system wiring information.

Vessel Turning During Startup

If the vessel turns during the 60-second startup sequence that occurs immediately after turning on the power to the TracVision G4, the antenna gyro will record that variable motion as "standing still." This may cause the antenna to track improperly. To solve this problem, turn the TracVision G4 off for at least 10 seconds. Turn the system back on, ensuring that the vessel is either motionless or traveling in a straight line for the 60 seconds immediately following power-up.

Incorrect Satellite Configuration (European Systems Only)

The satellite configuration on European IRDs must match the satellite settings on the TracVision G4 system.

- Satellite A on the TracVision G4 must be the same satellite as IRD Alternative 1 (or A, based on your IRD) and must be assigned the IRD DiSEqC 1 setting.
- Satellite B on the TracVision G4 must be the same satellite as IRD Alternative 2 (or B, based on your IRD) and must be assigned the IRD DiSEqC 2 setting.

Refer to your IRD user manual for complete instructions on configuring your IRD.

Satellite Signal Blocked

Satellite signals can be blocked or degraded by buildings, other vessels, or equipment on the vessel itself. Refer to *“Choosing the Best Location for the TracVision Antenna”* on page 12 to make certain that the TracVision G4 antenna unit is in the optimal location. Simply moving the vessel to clear an external obstruction will also restore signal quality.

Satellite Coverage Issue

TracVision G4 will provide outstanding reception within the 18" (45 cm) antenna coverage area for your satellite television service of choice. However, signal quality can be degraded as you approach the fringe coverage areas. Refer to your satellite television service manual to check the viable coverage area for a 18" (45 cm) antenna.



For your convenience, KVH provides links to several web sites that offer satellite coverage information. Simply go to our web site at www.kvh.com/footprint.

Radar Interference

The energy levels radiated by radar units can overload the antenna's front-end circuits. Refer to *“Choosing the Best Location for the TracVision Antenna”* on page 12 to make certain that the TracVision G4 antenna unit is in the optimal location with regard to your radar unit.

Satellite Frequency Data Changed

If some channels work, while one or more other channels do not, or the antenna cannot find the satellite, the selected satellite's frequency data may have changed. To update this frequency data, refer to *"Updating Satellite Frequency Data" on page 88*.

Incorrect or Loose RF Connectors

As part of preventive maintenance (described in *Section 5.2, "Preventive Maintenance" on page 103*) KVH recommends checking the antenna unit's cable connections. A loose RF connector can reduce the signal quality. In addition, if you are unable to switch satellites using your IRD remote, make sure that your IRD's RF cable is connected to the antenna baseplate connector labeled "RF1" (see *Section 2.5, "Connecting the IRD(s) on page 26*).

Type of Multiswitch Used (North American Systems Only)

An active (not passive) multiswitch must always be used to connect the TracVision G4 system to multiple IRDs. Refer to *Section 2.5, "Connecting the IRD(s)" on page 26* for directions on proper multiswitch/multiple IRD cabling.

4.3 GyroTrac-specific Issues

The GyroTrac is designed for reliable, easy use. This section provides a brief overview of some potential operational issues.

Issue 1:

System is installed correctly and power is available, but the system is non-functional.

Solution:

Check the 4-amp fuse within the ADCU. Remove the two screws securing the top and the base of the ADCU, and remove the ADCU's top cover. The fuse is secured in brackets on the upper printed circuit board (PCB). Remove the damaged fuse and replace with a new, functional fuse.

Issue 2:

System fails the startup routine and the ADCU displays "Errors Detected."

Solution:

GyroTrac will not operate unless the system passes the startup self-tests. The following actions may be taken in this instance.

- Shut down the system, then restore power.
- Shut down the system and verify proper wiring as detailed in *Section 2.6, "Wiring the ADCU" on page 29*.
- Contact a KVH dealer or distributor for further assistance.

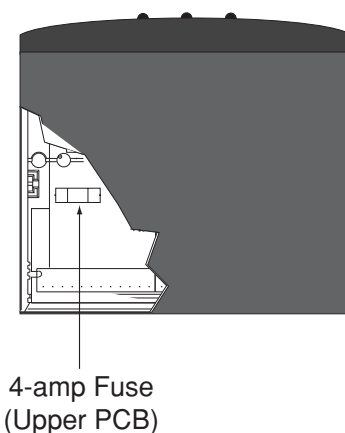
Issue 3:

GyroTrac is connected to a TracVision G4 system but there is no communications between GyroTrac and the antenna, and you are unable to access antenna-specific menus on the ADCU.

Solution:

Verify that GyroTrac is configured as a TracVision component, as detailed in *"Selecting TracVision or GyroTrac-only Operations" on page 76*.

Figure 4-1
ADCU Fuse Location
(Top Cutaway)



Issue 4:

There is no data output through Serial Port #3.

Solution:

Serial Port #3 provides no output when GyroTrac is configured as a component within a GyroTrac-compatible TracVision system.

4.4 IRD Troubleshooting

The IRD that was provided with your satellite television service may also be the cause of less-than-ideal operation. First check the IRD's configuration to ensure it is set up for the desired programming. In the case of a faulty IRD, refer to your IRD user manual for service and warranty information. If the IRD is both configured properly and fully functional, contact your local KVH dealer or service center for assistance.

4.5 Antenna Gyro and LNB Faults

Section 5, "Maintenance" on page 101 provides detailed instructions for authorized service personnel who may be required to replace the TracVision G4 antenna gyro or the LNB.

4.6 Computer Diagnostics

TracVision G4 has been designed to provide diagnostic readouts viewed on a PC having an RS-232 serial communication port. If you are unable to isolate a system problem, set up for computer diagnostics as described on the following page. System problems will most likely be found somewhere through the diagnostic readouts.

The diagnostics procedure requires Windows Hyperterminal (or other terminal emulation software, such as PROCOMM). Use the settings appropriate to your application.

1. Connect one end of the PC data cable to the DB9 maintenance port connector on the rear of the ADCU. Connect the other end to the serial port on your PC (a 9-pin/25-pin connector adapter may be needed for some PCs).

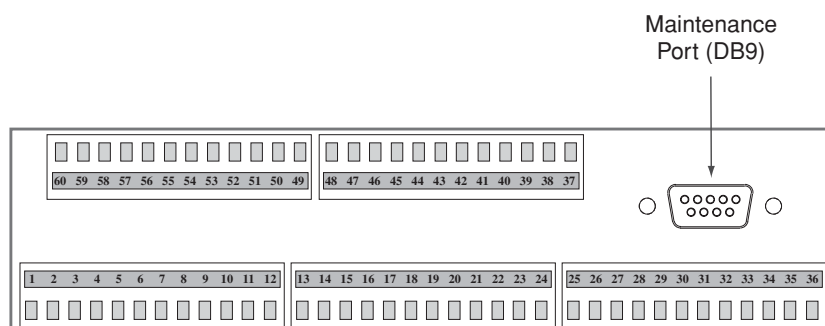


Figure 4-2
ADCU Maintenance Port

2. Open the terminal emulation software and establish the following settings:
 - 9600 baud
 - no parity
 - 8 data bits
 - 1 start bit
 - 1 stop bit
 - no flow control
3. Apply power to the TracVision G4 system and allow the system to complete full initialization. Data should be scrolling on the PC display to identify any system problems detected. If no data is seen, recheck your connections and the terminal software setup.



Appendix F on page 143 shows the diagnostic information available in the startup data sequence.

4.7 Maintenance Port Parser Commands

TracVision G4 system parser commands are detailed in *Appendix H on page 151*.

5 — Maintenance

This section identifies system components that may be replaced in the field, details how to replace those components, and lists preventive maintenance routines.

Contents

5.1	Warranty/Service Information	103
5.2	Preventive Maintenance	103
5.3	TracVision G4 Field Replaceable Units	104
5.4	Replacing the Main PCB or Fuses	106
5.5	Replacing the RF PCB	109
5.6	Replacing the Antenna Gyro Assembly	111
5.7	Replacing the Elevation Motor or Belt	113
5.8	Replacing the LNB	115
5.9	GyroTrac Field Replaceable Units	117
5.10	Preparation for Shipment	118

5.1 Warranty/Service Information

For information on KVH warranty, repair, and liability policies, please refer to the complete warranty statement provided at the conclusion of this manual. If you have any questions, please call your local authorized dealer/installer or distributor, or contact KVH or KVH Europe directly.

IMPORTANT! Before returning the product, be sure to obtain an RMA number from KVH's Technical Support Department and write the number on the outside of the box. Shipments received without an RMA number will be returned to you at your expense.



Detailed information on KVH's global support program and how to contact KVH or a dealer near you is available at www.kvh.com/global_support.

5.2 Preventive Maintenance

TracVision G4 requires minimal preventive maintenance. The following tasks are sufficient to maintain peak performance.

Monthly

- Wash the exterior of the radome and baseplate assembly with fresh water; a mild detergent may be added to remove grime. Use caution when spraying the radome directly with high-pressure water.
- Do not apply abrasive cleaners or volatile solvents such as acetone to the ABS radome.
- Check all connectors at the sensor module, ADCU, antenna baseplate, and IRD. Remove connectors and examine for signs of corrosion; clean as needed.



When cleaning the radome, avoid any compounds that react with plastic.

Semi-Annually

- Remove the radome and examine the interior of the antenna unit for signs of corrosion, loose connections, or frayed or broken wires.



The serial number for your TracVision G4 will be required during any troubleshooting or service calls. You will find the serial number on the first page of this manual.

5.3 TracVision G4 Field Replaceable Units

The TracVision G4 has been designed with durability and low maintenance in mind. If you experience an operating problem or otherwise require technical assistance, please contact your local authorized TracVision G4 dealer/installer or distributor. If an authorized dealer/installer or distributor is not located nearby, contact KVH or KVH Europe directly at the telephone, fax, or e-mail listings on the first page of this manual.

Replacement part numbers for field replaceable units (FRUs) that can be serviced in the field are listed in Table 5-1. GyroTrac field replaceable units are listed in *Section 5.9, "GyroTrac Field Replaceable Units"* on page 117. These parts may be obtained from any KVH authorized dealer/installer or may be ordered directly from KVH.

Table 5-1

TracVision G4 Field Replaceable Units



To help us continually improve the quality and reliability of our systems, please return any failed component to KVH or KVH Europe (care of the mailing address listed on the first page of this manual) after you receive your replacement part.

FRU	Part Number
Radome	02-0925-03
Main PCB	02-0992
RF PCB	02-1342
Antenna Gyro Sensor	02-1090
Antenna Gyro Gasket	24-0139
Elevation Drive Belt	24-0105-104
Elevation Motor	02-1356
North American LNB [†]	02-0870
European LNB ^{††}	02-1278
Data Cable	32-0619-50 [†] 32-0619-100 ^{††}
RF Cable	32-0417-50 [†]
PC Cable	32-0628-06
Power Cable	32-0510-50
Ground Cable	32-0583-50
CPU Fuses	16-0017-3150

[†] North American system

^{††} European system

The antenna unit's printed circuit boards (PCBs), gyro, LNB, elevation motor, and elevation drive belt may be removed and replaced on site using common hand tools. Other TracVision G4 service must be done by your authorized dealer/installer, distributor or by KVH. Evidence of tampering or unauthorized repairs will void the warranty. The following sections provide step-by-step procedures for removing and replacing field replaceable units.

Figure 5-1 depicts the location of a number of components within the TracVision G4 antenna unit.



TracVision G4 components receive power from multiple sources. Do not open any electrical assemblies or attempt servicing until IRD power and vessel input power are disconnected.

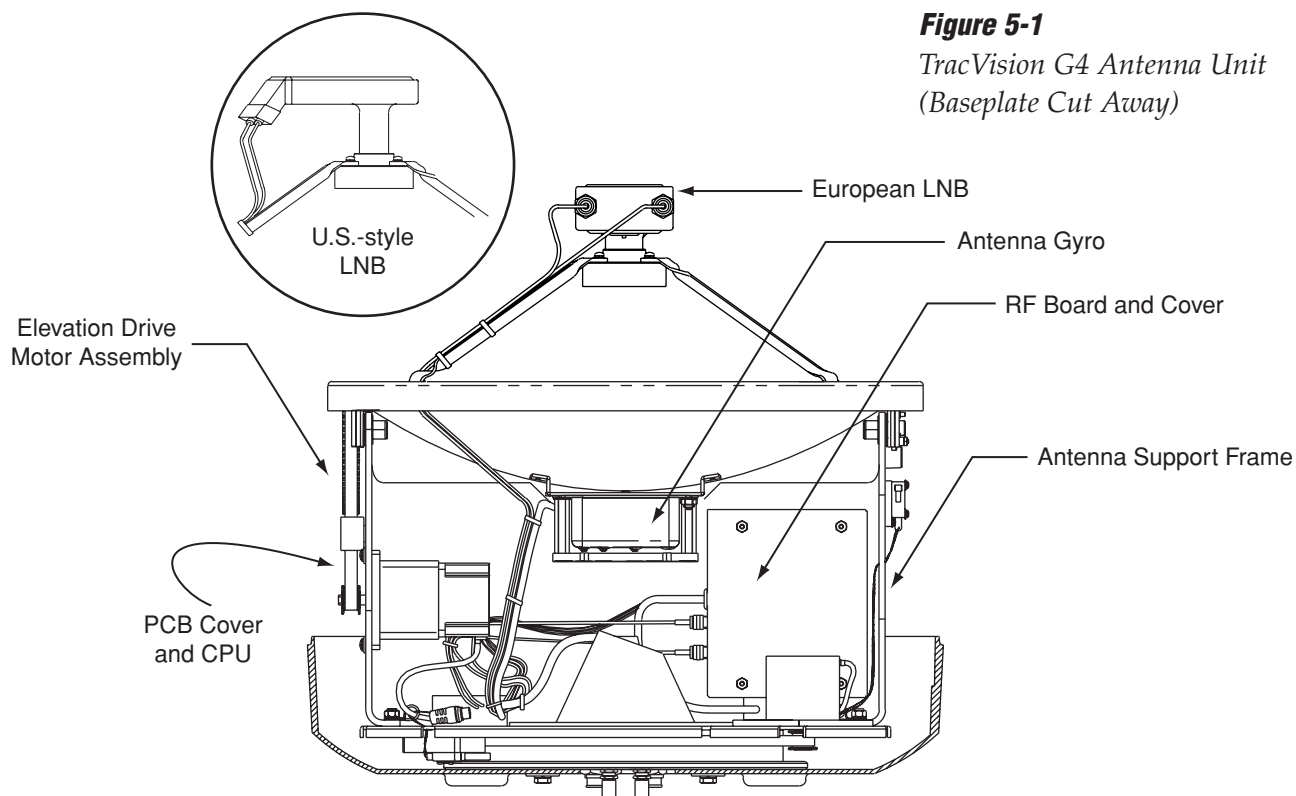


Figure 5-1

*TracVision G4 Antenna Unit
(Baseplate Cut Away)*

5.4 Replacing the Main PCB and Fuses

The main PCB is protected by a cover fastened to the antenna support frame. This cover must be removed to gain access to the main PCB and fuses discussed in the following sections.

Removing the Main PCB Cover

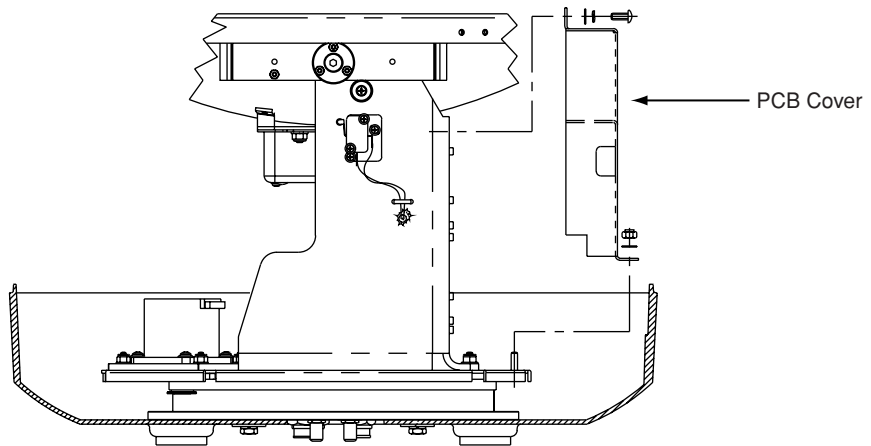
1. Using a $\frac{3}{8}$ " nut driver/socket, remove the three nuts and washers from the PCB cover's bottom flange.

Figure 5-2

PCB Cover Removal



The PCB cover fits snugly over the PCB. When removing or replacing the cover, take care to ensure that the cover does not dislodge any of the Molex connectors, as this will cause system errors and improper operation.



2. Remove the three Phillips screws and washers from the PCB cover's upper flange.
3. Remove the PCB cover and set aside.

Replacing the Main PCB

1. With a PC connected to the ADCU's maintenance port, apply power to the antenna unit.
2. Record the system serial number for later re-entry (the serial number is listed at the beginning of the startup sequence, as shown in *Appendix F on page 143*).
3. Disconnect power from the antenna unit and the IRD.
4. Remove the PCB cover, as explained in *"Removing the Main PCB Cover" on page 106*.
5. Disconnect all Molex connectors from the main PCB (see Figure 5-3).



Refer to Section 4.6, "Computer Diagnostics" on page 98 for complete details on connecting a PC to the system via the maintenance port.

Figure 5-3

Main PCB Connector Locations (Rear View)

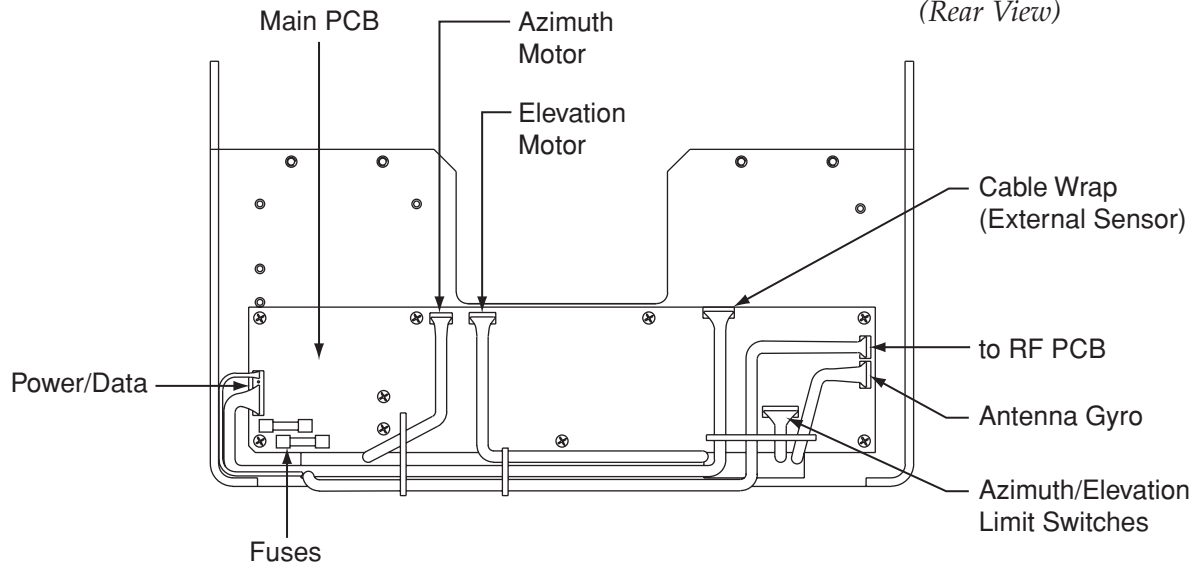
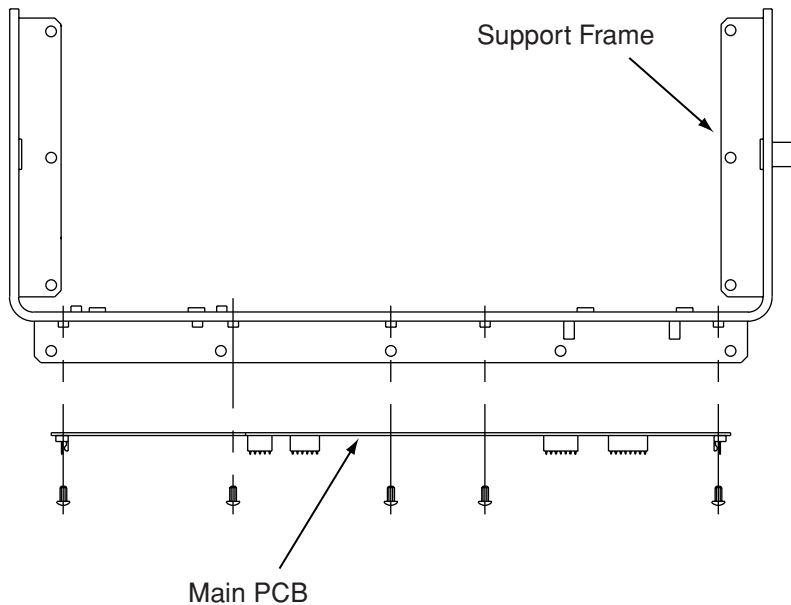


Figure 5-4
Main PCB Mounting (Top View)



6. Remove the nine #6-32 screws that secure the PCB to the antenna frame (see Figure 5-4).
7. Remove the PCB from the antenna frame.
8. Reverse this process to install the replacement PCB. Reconnect all connectors removed in Step 5.
9. Reinstall the PCB cover.
10. Apply power to the antenna unit.
11. Type **HALT<cr>** (<cr> indicates a carriage return/ENTER key).
12. Type **DEBUGON<cr>**.
13. Type **=TVG4HP<cr>**.
14. Type **=SERNUM,<serial number><cr>**, where <serial number> = the system serial number you recorded in Step 2.
15. Type **ZAP<cr>** to restart/reinitialize the system.
16. Calibrate the antenna gyro as explained in "Calibrating the Antenna Gyro" on page 112.
17. Reinstall your selected satellites as directed in Section 2.9, "Installing Satellites Using the ADCU" on page 44.

Replacing a Fuse

Two 5x20 mm, 3.15-amp, 250-volt fast-blow fuses are mounted to the main PCB (see Figure 5-3 on page 107). If one of these fuses has blown or been broken, simply remove the bad fuse and replace with a good fuse of the same rating.

5.5 Replacing the RF PCB

1. The RF PCB receives operating voltages from both the main PCB and the IRD (via the RF cable). Ensure that *all* power (including the IRD) is turned off before proceeding.
2. Using a $\frac{5}{16}$ " socket wrench, remove the four nuts and washers securing the RF PCB cover (see Figure 5-5). Set the hardware and cover aside.

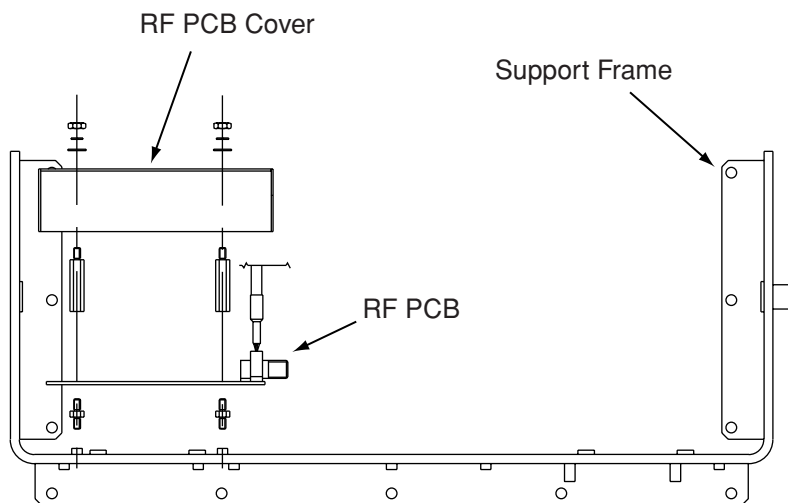


Figure 5-5

RF PCB Mounting (Top View)

Figure 5-6
RF PCB Connector Locations
(Rear View)

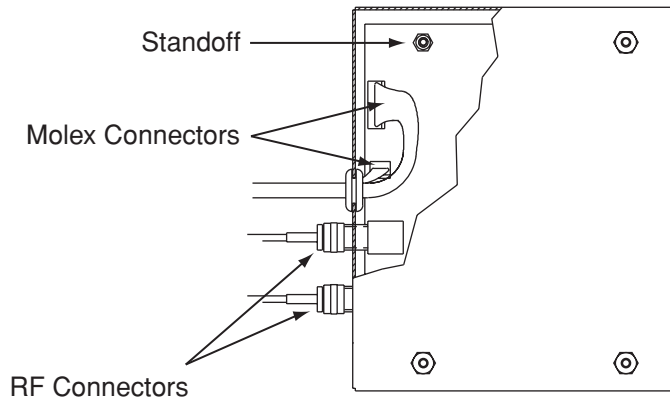
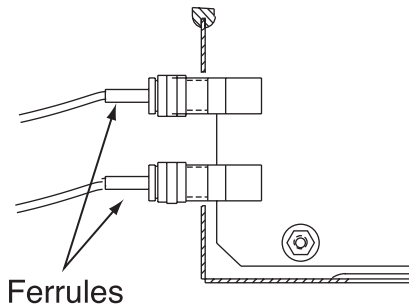


Figure 5-7
RF Cable Ferrules



Failure to hold the ferrules tightly while loosening the RF connectors can result in damage to the cables and reduce the signal quality.

3. Unplug the Molex connectors from the RF PCB (see Figure 5-6).
4. If the top RF cable is not already marked, **label it** so that the RF cables can later be plugged into the proper positions on the new PCB.
5. Using a $\frac{7}{16}$ " wrench, carefully remove the two RF cables from the RF PCB. Hold the RF connector ferrules while loosening the connectors to avoid excess stress on or twisting of the cables (see Figure 5-7).
6. Using a $\frac{1}{4}$ " nut driver/socket, remove the four $1\frac{1}{16}$ " standoffs and set aside.
7. Remove the old RF PCB.
8. Install the new RF PCB, making certain to align the PCB so that the RF connectors are facing inward (see Figure 5-1 on page 105).
9. Apply a drop of Loctite to one end of the four $1\frac{1}{16}$ " standoffs. Install the four standoffs, Loctite-applied ends facing the RF PCB. Secure in place using the nut driver.
10. Reattach the RF cables, making certain to connect them in their original positions (marked cable on top). **Do not exceed 5 in-lbs of torque.**
11. Reattach the Molex connectors to the RF PCB.
12. Insert the split rubber grommet surrounding the Molex connector cables into the small slot on the new RF PCB cover.
13. Secure the RF PCB cover using the nuts and washers removed in Step 2.

5.6 Replacing the Antenna Gyro Assembly

1. Remove the main PCB cover, as described in "Removing the Main PCB Cover" on page 106.
2. Remove the four Phillips screws, four washers, and the counterweight from the end of the antenna gyro (see Figure 5-8).

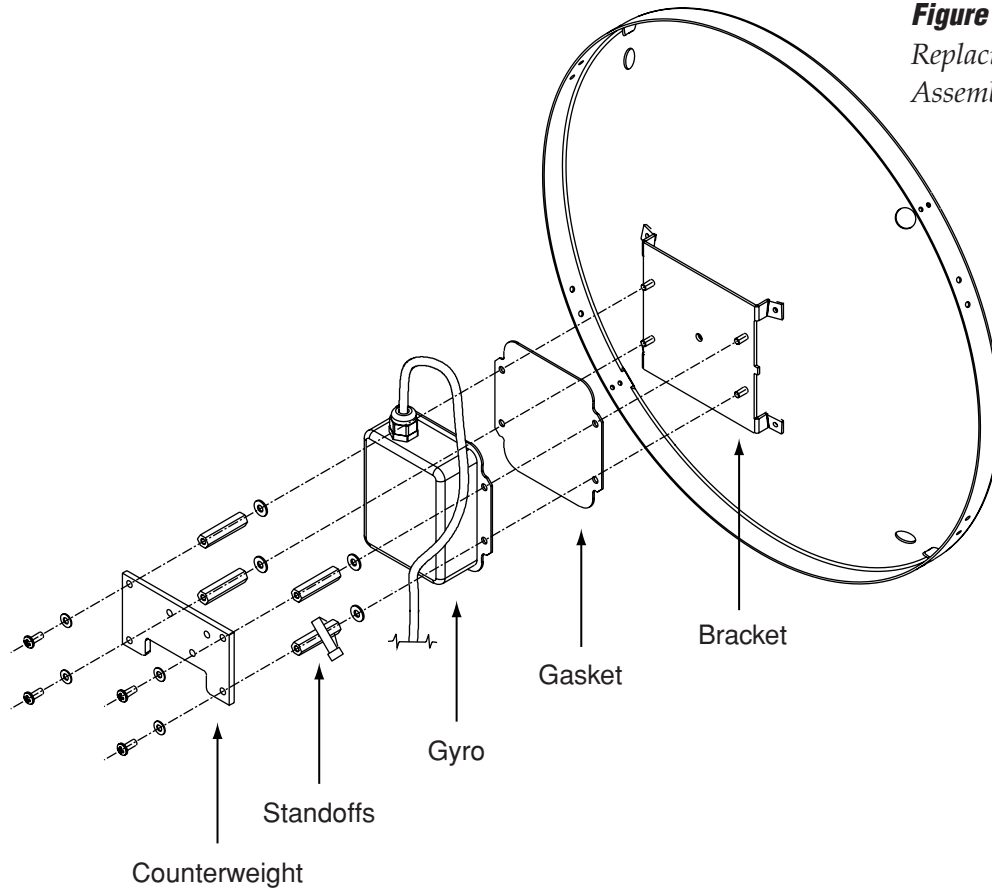


Figure 5-8

Replacing the Antenna Gyro Assembly

3. Using a $\frac{3}{8}$ " nut driver/socket, remove the four standoffs and washers securing the antenna gyro to the reflector bracket (see Figure 5-8). Slide the tie-wrap, which secures the antenna gyro cable, off the bottom right standoff.
4. Remove the tie-wraps securing the gyro cable to the RF cables.
5. Disconnect the antenna gyro Molex connector from the main PCB (see Figure 5-3 on page 107). Remove the old antenna gyro assembly.



Make sure the cable passes through the PCB access slot to protect the wires from the edge of the PCB frame.



When rotating the antenna by hand, go slowly! Hitting the mechanical stops with excessive force will damage the azimuth limit switch.



Refer to Section 4.6, "Computer Diagnostics" on page 98 for complete details on connecting a PC to the system via the maintenance port.

6. Connect the new antenna gyro's Molex connector to the main PCB.
7. Replace the antenna gyro gasket (see Figure 5-8).
8. Using the standoffs and washers removed in Step 3, secure the new antenna gyro to the reflector bracket. The antenna gyro should be oriented so that the cable extends from the top of the gyro, as shown in Figure 5-8.
9. Using a tie-wrap, secure the antenna gyro cable to the bottom right standoff.
10. Reattach the counterweight, screws, and washers removed in Step 2.
11. Redress the gyro and RF cables using tie-wraps.
12. Carefully move the reflector through its range of motion to ensure that the cable moves freely between the elevation mechanism and the lower assembly. Adjust the antenna gyro cable as necessary to ensure proper motion.
13. Reinstall the PCB cover.

Calibrating the Antenna Gyro

1. With a PC connected to the ADCU's maintenance port, apply power to the antenna unit.
2. Type **HALT<cr>** (<cr> indicates a carriage return/ENTER key) while the system is performing the limit switch initialization routine. The system will complete the initialization function by finding the azimuth and elevation switch limits and then go to the home position.

IMPORTANT! Record the 8-digit serial number displayed in the startup message.

3. Type **DEBUGON<cr>** to enter Debug Mode.
4. Type **CLEAREE<cr>**.
5. Type **ZAP<cr>** to restart/reinitialize the system.
6. Type **HALT<cr>**.
7. Type **DEBUGON<cr>**.
8. Type **=TVG4HP<cr>**.

9. Type **HALT<cr>**.
10. Type **DEBUGON<cr>**.
11. Type **=LSTEST<cr>**.
12. Type **EL,300<cr>**.
13. Type **=CALGYRO<cr>**. Verify that the Antenna Gyro Azimuth scale factor is between -0.00090 and -0.00110 and the Antenna Gyro Elevation scale factor is between 0.00090 and 0.00110.
14. Type **=SERNUM,<serial number><cr>**, where <serial number> = the system serial number that you recorded in Step 2.
15. Type **ZAP<cr>** to restart/reinitialize the system.

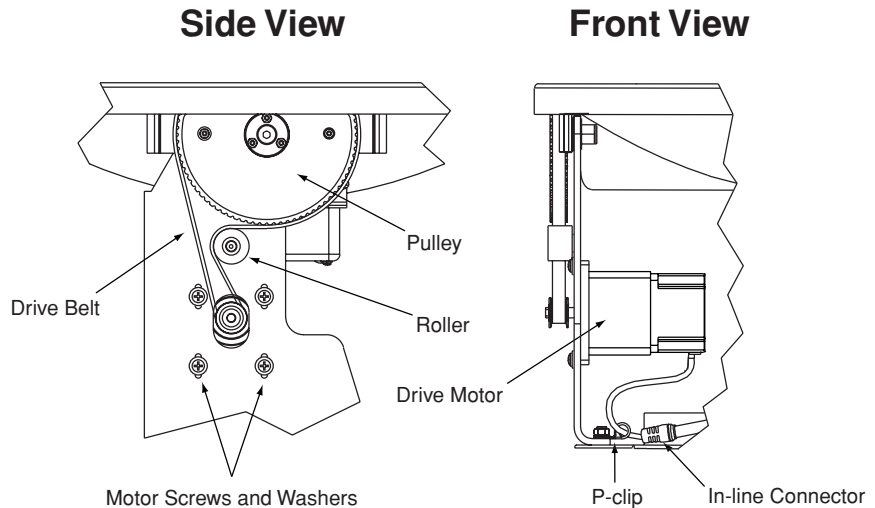
If you have a GPS connected to the GyroTrac, no further action is required. If you do **not** have a GPS connected to the GyroTrac, KVH recommends that you complete the following steps to speed satellite acquisition and improve system performance:

16. Type **HALT<cr>** while the system is performing the limit switch initialization routine. The system will complete the initialization function by finding the azimuth and elevation switch limits and then go to the home position.
17. Determine your vessel's current latitude and longitude to the nearest degree.
18. Type **GPS,AA,B,CCC,D<cr>** where:
 - AA = Latitude in degrees
 - B = N (North) or S (South)
 - CCC = Longitude in degrees
 - D = E (East) or W (West)
19. Verify that the response shows the correct parameters.
20. Type **ZAP<cr>** to restart/reinitialize the system.

5.7 Replacing the Elevation Motor and Belt

The elevation motor is mounted to the inside of the support frame. Machine screws and washers hold the drive motor in position to maintain proper tension on the toothed drive belt. Figure 5-9 shows the arrangement of motor, drive belt, and antenna pulley.

Figure 5-9
Elevation Drive Mechanism



Replacing the Drive Belt

1. Loosen the four #8-32 Phillips screws until the motor is free to move upward. Raise the motor to the top of the slots and retighten the screws to hold it there.
2. Roll the belt over the motor hub while slowly moving the antenna reflector through its vertical travel. Work the belt out from between the antenna pulley and reflector.
3. Carefully work the new belt in between the antenna pulley and the reflector. Ensure that the teeth are on the inside of the belt. Feed the belt behind the roller and over the motor hub. Once the belt is in place, work it back and forth to ensure that the belt is aligned and the teeth are engaged with the motor pulley.

4. Loosen the screws and gently press downward on the motor hub until the drive belt is at proper tension. Adjust the belt tension for a maximum of $\frac{1}{8}$ " (3 mm) deflection with moderate finger pressure between the motor and antenna pulley. Some readjustment may be necessary if the belt tension results in excessive antenna reflector vibration.
5. Tighten the screws.

Replacing the Elevation Drive Motor

1. Remove the P-clip that secures the elevation motor cable to the support frame (see Figure 5-9 on page 114).
2. Disconnect the elevation motor cable from the in-line connector (see Figure 5-9).
3. Remove the four Phillips screws and washers that secure the motor to the support frame (see Figure 5-9). Remove the motor assembly.
4. Install the new motor assembly with the elevation motor cable facing down, as shown in Figure 5-9. Reinstall the screws and washers but do not tighten.
5. Raise the motor and work the toothed drive belt over the outer lip of the motor hub. Press down gently on the motor body while rotating the antenna reflector up and down to ensure free movement.
6. Adjust the belt tension for a maximum of $\frac{1}{8}$ " (3 mm) deflection with moderate finger pressure between the motor and antenna pulley. Some readjustment may be necessary if the belt tension results in excessive antenna reflector vibration.
7. Tighten the screws.
8. Connect the new elevation motor cable to the in-line connector.
9. Secure the elevation motor cable to the support frame using the P-clip that you removed previously.



Excessive belt tension may result in antenna reflector vibration.



Ensure that the IRD is turned off or disconnected from its power source before removing or reconnecting the LNB.

5.8 Replacing the LNB

The LNB assembly receives power from the IRD via the RF PCB. Be certain that the IRD is turned off or disconnected from its power source before removing or reconnecting the LNB.

Replacing a North American LNB

1. Using a $\frac{7}{16}$ " wrench, carefully disconnect both RF connectors from the LNB.
2. Loosen the two wing screws on the throat of the choke feed until the LNB is free to slide out. Withdraw the LNB as shown in Figure 5-10.

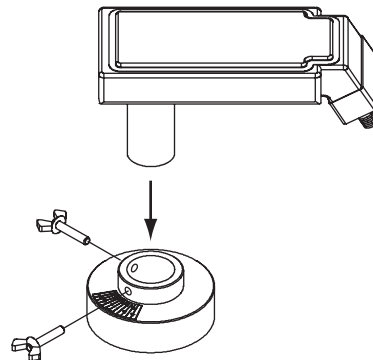


Figure 5-10

North American LNB Removal

3. Insert the replacement LNB as far as it will go, ensuring it reaches the bottom of the feedhorn. Be careful not to puncture or dislodge the plastic seal covering the LNB throat. Orient the LNB to align with the strut holding the pair of RF cables.
4. Apply a small amount of thread-locking compound (Loctite 425 or equivalent) to the wing screw threads and tighten the screws to secure the LNB in position.
5. Reattach the RF connectors to the LNB.

Replacing a European LNB

1. Using a $\frac{7}{16}$ " wrench, carefully disconnect the RF connectors from the LNB.
2. Note the currently set skew value, as indicated by the stickers on the LNB and choke assembly (see Figure 5-11).

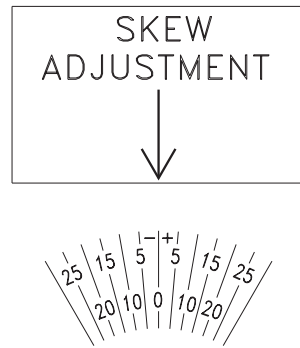


Figure 5-11

Skew Angle Labels

3. Loosen the wing screws and remove the LNB from the choke assembly as shown in Figure 5-12.

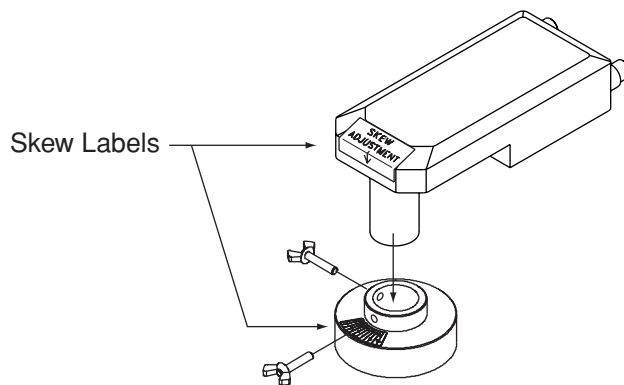


Figure 5-12

European LNB Removal

4. Insert the replacement LNB as far as it will go, ensuring it reaches the bottom of the feedhorn. Be careful not to puncture or dislodge the plastic seal covering the LNB throat. Adjust the LNB's position so that it has the same skew value noted in Step 2.
5. Apply a small amount of thread-locking compound (e.g., Loctite 425 or equivalent) to the wing screw threads and tighten the screws to secure the LNB in position.
6. Reattach the RF connectors to the LNB.

5.9 GyroTrac Field Replaceable Units

GyroTrac has been designed with durability and low maintenance in mind. If you are experiencing an operating problem or otherwise require technical assistance, please contact your local KVH dealer or distributor. Have the GyroTrac serial number ready with a list of the trouble symptoms. If an authorized dealer or distributor is not located nearby, contact KVH directly at the telephone, facsimile, or e-mail listings on the first page of this manual.

Replacement part numbers for components that can be serviced in the field are listed in Table 5-2. These parts may be obtained from any KVH-authorized dealer/installer or may be ordered directly from KVH.

Table 5-2
GyroTrac Field Replaceable Units

FRU	KVH Part No.
Sensor Module	02-1154
ADCU	02-0961
Flush Mount ADCU Panel	20-0667
Horizontal Sensor Bracket	20-0658
Vertical Sensor Bracket	20-0666
Terminal Strip Connectors	23-0223-12
Sensor to ADCU Data Cable	32-0623-30
ADCU PCB Fuse, 4-amp	16-0017-4000

Figure 5-13
Data Cable Terminal Arrangement

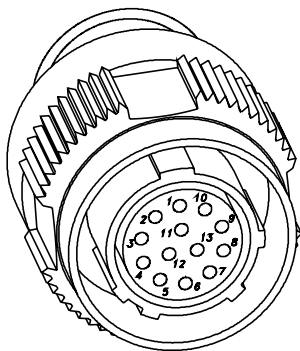


Table 5-3
Data Cable Wiring/Terminal Assignments

Connector Terminal	Wire Color	Function
1	Wht/Blu Stripe	FE_TXD+
2	Blu/Wht Stripe	FE_TXD-
3	Wht/Org Stripe	FE_RXD-
4	Org/Wht Stripe	FE_RXD+
10	Wht/Grn Stripe	GND
11	Grn/Wht Stripe	+12V
Shell	Shield	---

5.10 Preparing for Shipment

If you need to repack the antenna unit for shipment, the shipping restraints removed during installation must be replaced. Follow these steps to reinstall the restraints.

1. Rotate the azimuth mechanism slowly to find the limit switch stop. The front of the antenna should be facing the forward arrow.
2. Rotate the azimuth mechanism 180° in the opposite direction to ensure that the mechanism is not resting on the limit switch stop.
3. Insert the two azimuth shipping restraint bolts, washers, and spacers (removed during installation) into the rotating plate, as shown in Figure 5-14. Using a 10 mm wrench, secure the rotating plate to the metal base.



When rotating the azimuth mechanism by hand, go slowly! Hitting the mechanical stops with excessive force will damage the azimuth limit switch.

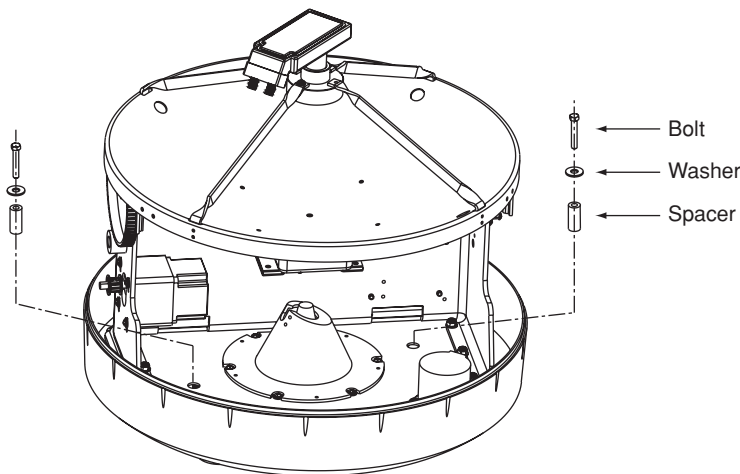
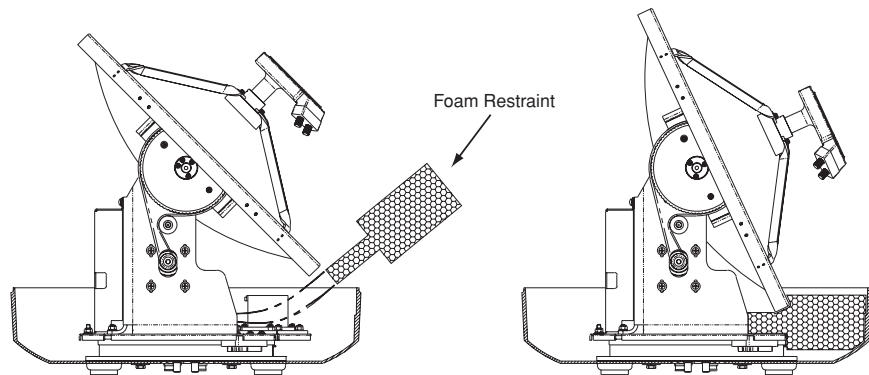


Figure 5-14
*Azimuth Shipping
Restraint Placement*

4. With the antenna reflector slightly elevated, slip the narrow end of the elevation shipping restraint beneath the lip of the reflector. Gently wedge the restraint inside the baseplate as shown in Figure 5-15.

Figure 5-15

Elevation Shipping Restraint Placement



KVH is not liable for damage caused by improper shipping.



Before returning the product, be sure to obtain an RMA number from KVH's Technical Support Department and write the number on the outside of the box. Shipments received without an RMA number will be returned to you at your expense.

5. Pack the TracVision G4 antenna unit in its original package.
6. As detailed in the warranty accompanying this product and printed on the last page of this manual, a Return Material Authorization (RMA) number is required prior to the return of the TracVision G4 system to KVH. Contact the KVH Technical Support Department at +1 401 847-3327 or via e-mail at techs@kvh.com to obtain the RMA number. Please review your warranty to familiarize yourself with all requirements, liabilities, and policies.

Appendices

This section contains several appendices of supplemental information, including mounting templates, wiring diagram, and parser commands.

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Appendix A

System Specifications

A.1 Antenna Specifications

Physical Characteristics

Antenna Unit	21" (53 cm) h x 19.2" (49 cm) d; 30 lbs (13.6 kg)
External Sensor	7.8" (19.8 cm) l x 5" (12.7 cm) w x 5" (12.9 cm) h
ADCU	7.3" (18.5 cm) d x 8.2" (20.8 cm) w x 2.6" (6.6 cm) h
Operating temperature	-25°C to +55°C (-13°F to +130°F)
Storage temperature	-40°C to +85°C (-40°F to +185°F)

Input Power

Input	11-16 VDC @ 3.5 amps nominal (4.5 amps peak)
-------	---

Antenna System Performance

Minimum EIRP	50-51 dBW
Elevation range	15°- 85°
Azimuth range	720°
Pitch/roll range	±15°
Pitch/roll rate	45°/second
Turn rate	45°/second
Yaw	±90° in 10 seconds
Tracking rate	30° per second
Position repeatability	0.1°
Surge/sway/heave	±0.2 G
Shock	20 G, 11 msec
Vibration	0.9 G rms over 5-33 Hz

Table A-1

*TracVision G4 Antenna
Physical Specifications*

Table A-2

TracVision G4 Power Specifications

Table A-3

*TracVision G4 Performance
Specifications*

A.2 GyroTrac Compass Specifications

Table A-4

*TracVision G4 GyroTrac
Performance Specifications*

Performance Data

Accuracy	$\pm 3.0^\circ$ peak; $\pm 1.0^\circ$ typical ¹
Repeatability	$\pm 0.25^\circ$
Resolution	$\pm 0.1^\circ$ (gyro ± 0.01)
Tilt angle/pitch & roll range	$\pm 45^\circ$
Rate gyro drift	0°/minute (auto-corrected)
Maximum angular velocity	45°/second
Bandwidth	10 Hz
Power/consumption	12-32 VDC/330 mA (stand-alone) <i>TracVision component: 11-16 VDC 3.5 amps nominal, 4.5 amps peak</i>
Data I/O format	RS-422 (NMEA 0183 Version 2.2)
Zero point stability	$\pm 0.8^\circ$

1. After calibration, free magnetic field to tilt angles of $\pm 20^\circ$; accuracy ± 5.0 RMS to $\pm 45^\circ$ tilt or roll.

Table A-5

*TracVision G4 GyroTrac
Environmental Specifications*

Environmental Data

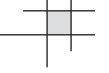
Operating temperature	-13°F to +130°F (-25°C to +55°C)
Storage temperature	-40°F to +185°F (-40°C to +85°C)
Maximum shock (performance)	20G, 11 msec
EMI/RFI	IEC 945; FCC Part 15J, Class B

Interface Data (Choice of 4 Simultaneous Outputs)

NMEA 0183 ver. 2.2:	
BWC	Bearing, distance to waypoint
GGA	GPS fix data
GLL	GPS latitude, longitude
HDG	Stabilized magnetic heading
HDM	Magnetic heading
HDT	True heading
VTG	Course over ground, speed over ground
XTE	Cross-track error (measured)
Cetrek	Proprietary digital output
Sine/Cosine	
3-wire	User-selectable reference/swing voltage
4-wire (B&G)	Set reference voltage to 3.5 V
Furuno	AD10S standard output

Table A-6

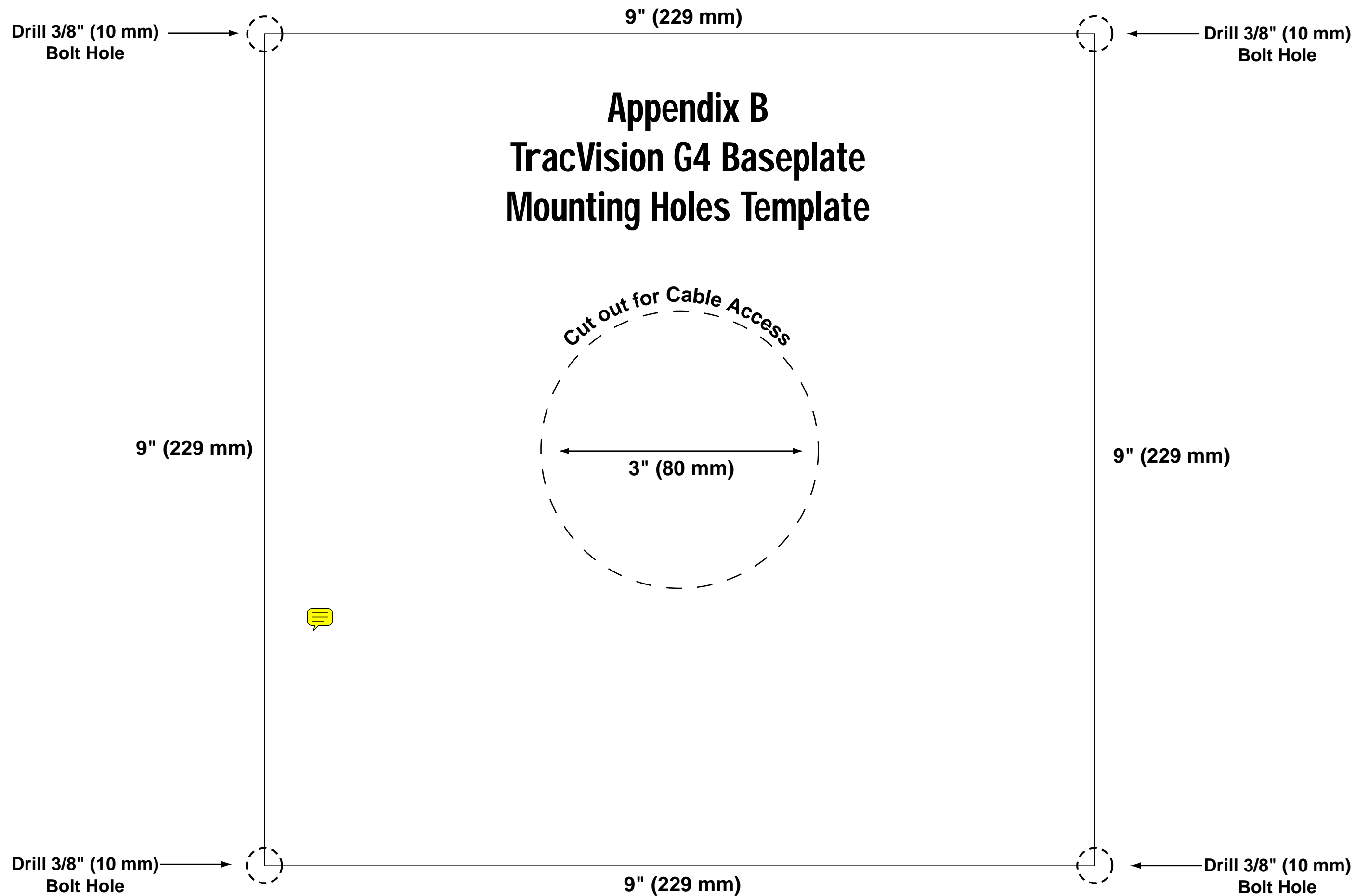
*TracVision G4 GyroTrac
Interface Specifications*



Appendix B

TracVision G4 Baseplate Mounting Holes Template

A template for the four mounting holes is presented on the following page.

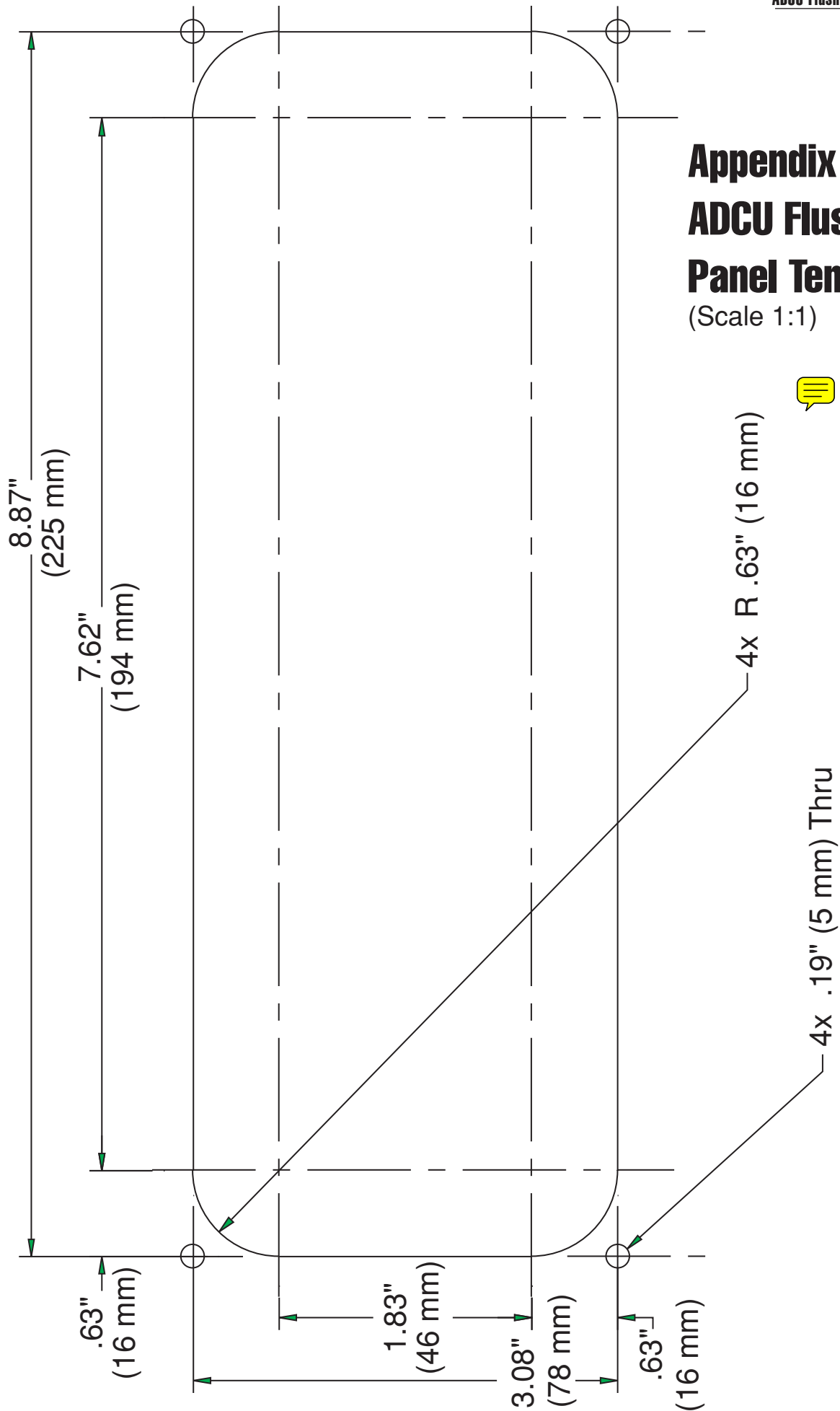




Appendix C

ADCU Flush Mount Panel Template

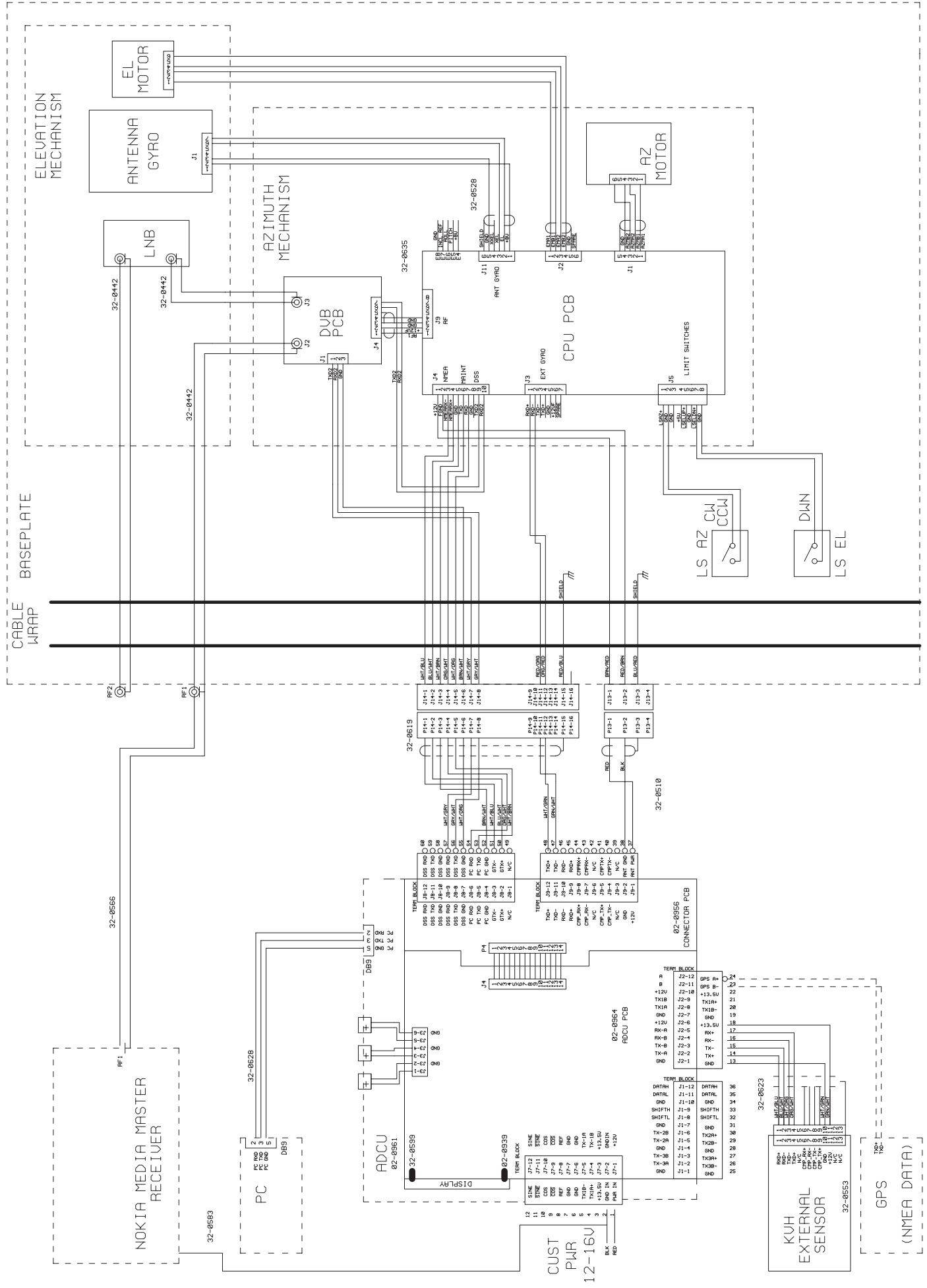
(Scale 1:1)



Appendix D

Comprehensive TracVision G4 System Wiring Diagram

The wiring diagram is presented on the following page.



Appendix E

Optional Rotating Card Display

The optional rotating card display presents true or magnetic heading using a compass card rotating under a fixed lubber line, with user-selectable red or green backlighting.

E.1 Specifications

Dimensions 5.6" (142 mm) x 5.6" (142 mm) x 3" (76 mm)

Weight 39 oz (1110 gm)

E.2 Mounting the Rotating Card Display

The rotating card display may be mounted either of two ways:

Option 1 - Free-standing on its Bracket

Option 2 - Flush with the Panel

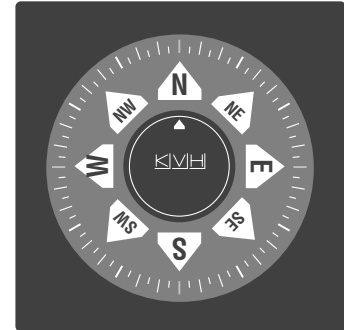
Templates for either method are provided at the end of this appendix. The unit should be located no closer than 36" (1 m) to any magnetic compass. Before installing, remove the display unit from its stand by removing the latch knobs on either side.

Option 1 - Bracket Mounting

1. Select a site with room for the unit to rotate in its bracket. Using Template E-1, mark and drill four ¼" (6 mm) holes in the mounting surface. Fasten the bracket in place with the screws provided.
2. Reattach the display unit to the bracket temporarily. Skip to *Section E.3, "Wiring the Rotating Card Display"* on the following page.

Figure E-1

Optional Rotating Card Display



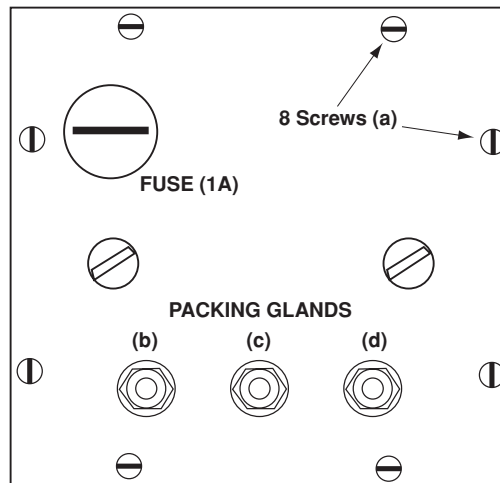
Option 2 - Flush Mounting

1. Using Template E-2, mark the cutout area in the mounting surface. Cut out the marked area and smooth the edges with a file. Test-fit the display unit in the cutout opening.
2. Remove the two 6 mm machine screws from the back of the display unit. Insert the display unit into the cutout; then place the panel mounting bracket clamp in position behind the display unit. Reverse the 6 mm screws and reinsert into the case through the bracket clamp. Tighten the screws to secure in place.

E.3 Wiring the Rotating Card Display

1. Refer to Figure E-2. To remove the backplate, remove 8 screws (a) and withdraw the backplate assembly. Separate the two pigtail plug connectors from the card assembly.

Figure E-2
*Rotating Card Display –
Removing the Backplate*



2. Pass the power supply and data cables through their packing glands (b, c, and d) from the outside and tighten the gland nuts before connecting wires.

- Refer to Figure E-3 below; connect the power and data wires to the terminal block as listed in Table E-1.

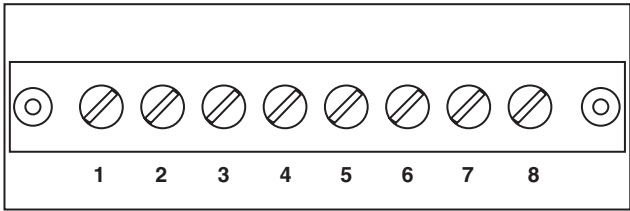


Figure E-3
Rotating Card Display – Terminal Strip Wiring

Term. #	Function
1	Output B (linked to terminal 5)
2	Output A (linked to terminal 6)
3	Shield for output cable
4	Shield for input cable
5	Input B (NMEA 0183 data)
6	Input A (NMEA 0183 data)
7	11-40 VDC NEG (-)
8	11-40 VDC POS (+)

Table E-1
Rotating Card Display – Terminal Strip Wiring Details

- Set the jumpers as shown in Figure E-4 to select red or green night illumination.

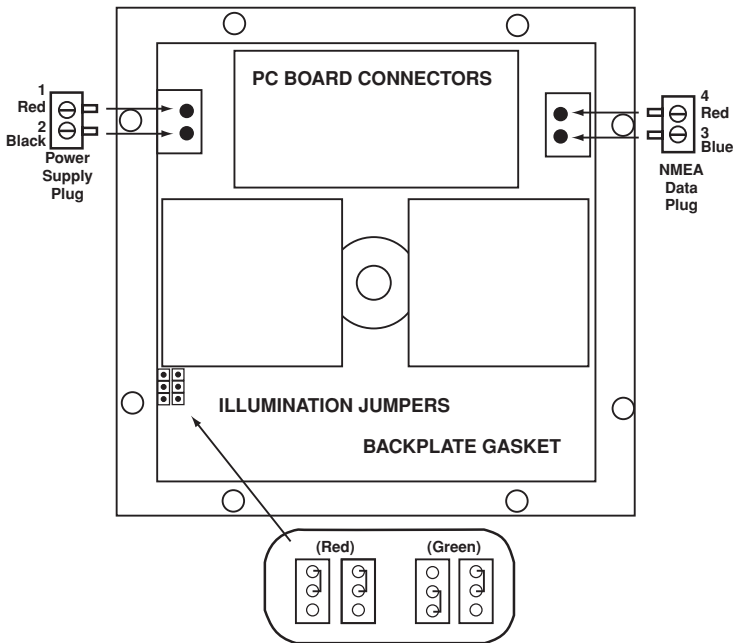
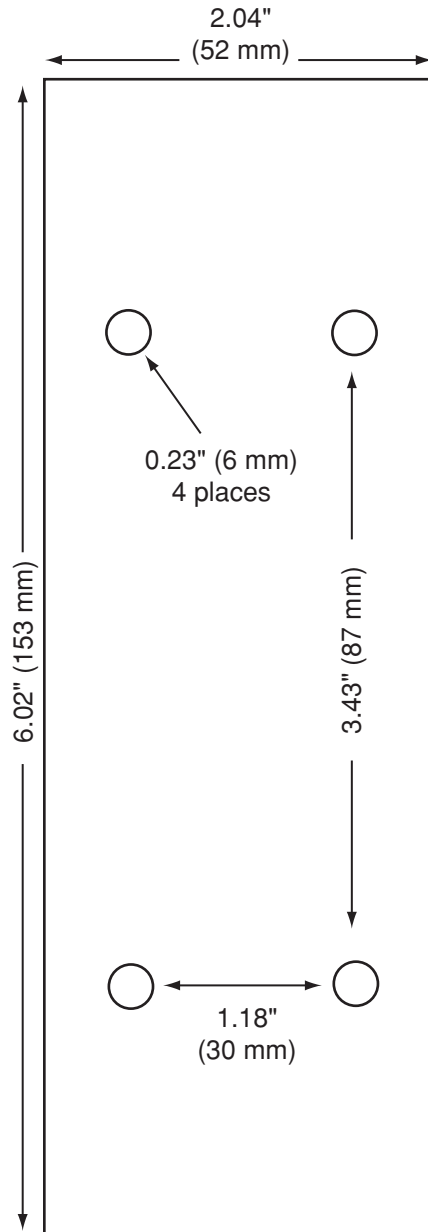


Figure E-4
Rotating Card Display – PC Board Jumpers and Connectors

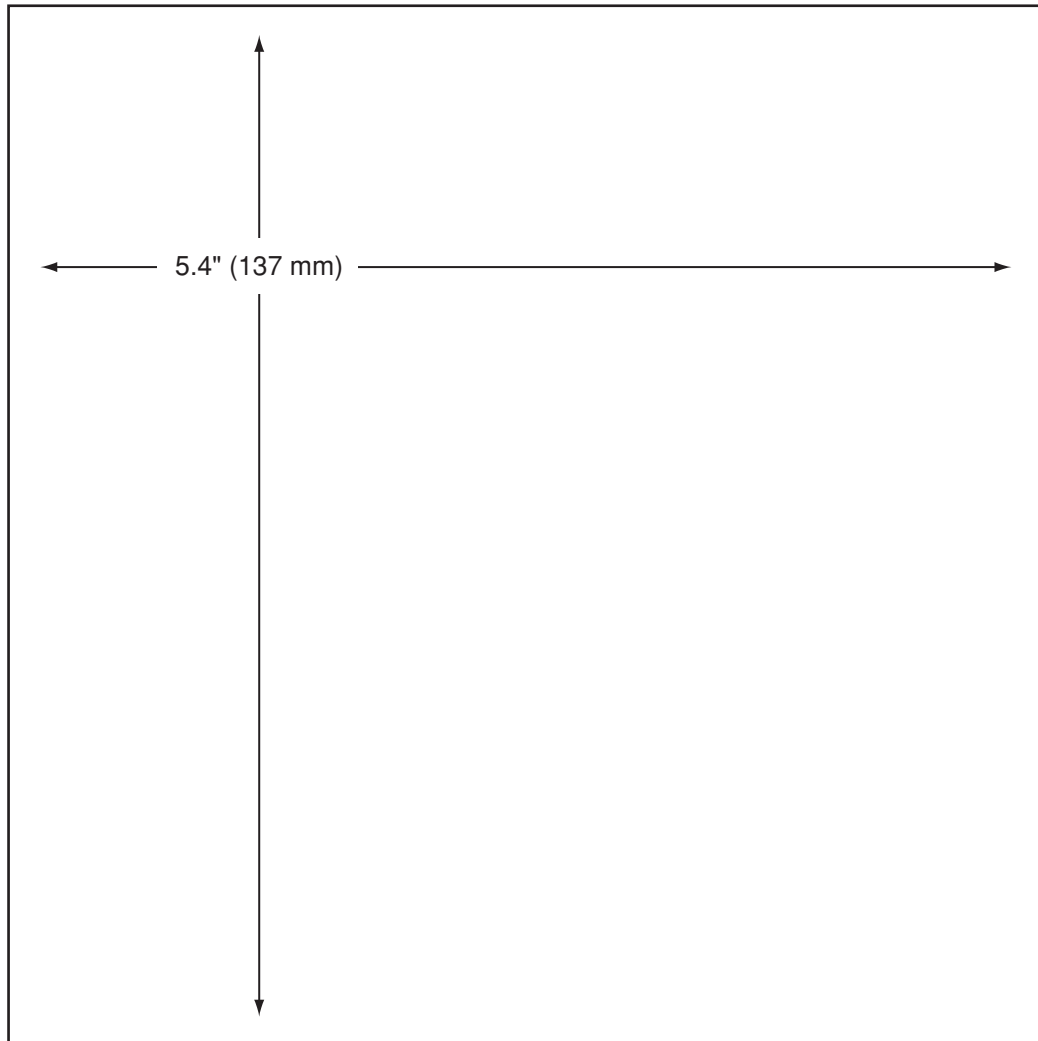
5. Check that the backplate gasket is in place. Return the power and data pigtail plugs to their respective PC board connectors.
6. Arrange the internal wiring before replacing and tightening the backplate screws.

Template E-1 Rotating Card Display Bracket Mounting





Template E-2 Rotating Card Display Panel Mounting



Appendix F

Startup Data Sequences

The data on the following pages presents a sample startup data sequence registered by the TracVision G4. These sequences may vary based on the software version loaded onto the TracVision G4 system. This data can be recorded using the data port and a PC.

```
TracVision G4 Controller Rev X - Version X.XX - Serial number XXXXXXXX
EAD Motors
RF: CHECKSUM
RF: ZAP
RF: ?PGM_908
RF: CHECKSUM: 0xF807
*** Initializing RF Controller ***
RF: S,A,V,U,V
RF: SATINSTALL,50,C,53,C
RF: L,B-----Identifies Satellite A or B as currently
RF: SATCONFIG                               loaded for acquisition
RF: F,A,12574,20000,56,0x0100,R,U,3-----Satellite Configuration Data, Satellite A
RF: F,A,12574,20000,56,0x0100,R,U,3
RF: F,A,12383,20000,56,0x0100,L,U,3
RF: F,A,12383,20000,56,0x0100,L,U,3
RF: F,B,12370,20000,56,0x1004,R,U,3-----Satellite Configuration Data, Satellite B
RF: F,B,12370,20000,56,0x1004,R,U,3
RF: F,B,12326,20000,56,0x1004,L,U,3
RF: F,B,12326,20000,56,0x1004,L,U,3
RF: RF PCB Version X.X -----Current RF software revision
RF: DVB/DSS 4
RF COMM: PASS-----PASS is expected
*** Initializing Antenna ***
*** NO GPS-Default Used ***
GPS: EXPRESSVU AZ = 208.5, EL = 38.1
Limit Switch Test
GPS: UTC: 083000.00, Lat: 4131.00N, Long: 7115.00W----GPS data from NMEA port
GPS: ECHO_119 AZ = 238.9, EL = 22.1-----Calculated satellite position based on GPS
Limit Switch Status: PASS-----PASS is expected
*** Initializing Ext Sensor ***
,h,0,S,h,1
RF: S,B,H,U,V
ES Status = @@
,h,0.5,h,1
ES Cal Score = 991-----Confirmed data from external sensor
EXT SENSOR: PASS
```

```

*** Initializing Rate Bias ***
RF: S,B,V,U,V
A/D: 2134 2034 456
A/D: 2139 2016 425
RF: S,B,H,U,V
A/D: 2125 1992 370
A/D: 2117 2112 384
Gyro Bias: Az = 2118.22, El = 2024.11-----Expected range is 1700-2300
Gyro Uncertainty: Az = 3.00, El = 3.00
*** Limit Switch Search ***
RATE BIAS: PASS-----PASS is expected
Searching for ECHO_119, Threshold = 1000
+POS: 353.3 22.1 419
RF: S,B,H,U,V
+POS: 59.6 22.1 425
Satellite Found: AZ = 251.2, EL = 22.1, RF = 1373
*** Entering Tracking ***
RF: Freeze #1
RF: Freeze #2
+POS: 350.7 22.0 2667
RF: S,B,V,U,V
+POS: 351.2 22.1 2982
RF: S,B,V,U,V
+POS: 352.0 22.4 2953
RF: S,B,V,U,V
+POS: 352.7 22.6 2821
RF: S,B,V,U,V
*** Network ID Check *** -----Comparing the tracked satellite's network ID to
+POS: 354.1 22.6 2370 the selected satellite's network ID
RF: S,B,V,U,V
+POS: 353.9 21.9 2788
RF: S,B,V,U,V
+POS: 354.9 22.5 1819
RF: Y,0x1004 -----Indicates positive satellite identification
*** Tracking ECHO_119 ***-----Identifies satellite currently tracked
Avg: 22.3 0.0 0.0 0.0 0.0 (TV broadcast image should be available)
RF: S,B,V,U,V
+POS: 354.5 22.1 3116
RF: S,B,V,U,V
+POS: 355.0 22.5 1868
RF: S,B,V,U,V
+POS: 354.0 22.0 2912
RF: S,B,V,U,V
+POS: 354.5 21.9 2114
RF: S,B,V,U,V
+POS: 353.1 21.9 2680
Avg: 22.3 21.8 0.0 0.0 0.0
Saved Sat Pos: AZ = 248.2, EL = 22.0

```


Appendix G

GyroTrac Data Outputs

The GyroTrac transmits up to five selectable message types simultaneously to external navigation devices connected to the ADCU. One output port is dedicated to the sine/cosine signal format, one is dedicated to the Furuno AD10S signal format, and three separate serial ports allow outputs of NMEA 0183, KVH RS-422, and Cetrek proprietary signal formats. Each of these message formats is described below. Step-by-step instructions for selecting desired message outputs is given in *Section 3, “Using the ADCU Interface”* on page 59.

G.1 Sine/Cosine Output

GyroTrac may be configured to provide either 3-wire or 4-wire sine/cosine output, but not both. Sine/cosine output message options are magnetic or true heading and a combination of reference and swing voltages used to denote the heading value. The reference and swing voltages are set through the ADCU to suit the requirements of the device using the data. [Default reference voltage is 2.5 volts; default swing voltage is ± 1.67 volts.] The allowable range for reference and swing voltages is 0 to 6.5 volts in 0.01 volt increments. The sine/cosine output is commonly used in ComNav, Robertson, and other autopilots.

B&G 4-wire Sine/Cosine

The B&G 4-wire sine/cosine output (also known as “differential sine/cosine”) is a substitute of the Halcyon® compass. The reference voltage should be set to 3.5 volts.



Refer to “Connecting the Sine/Cosine Interface” on page 35 for complete instructions on properly configuring GyroTrac and other navigational systems to use the sine/cosine output.



The maximum current that can be drawn from the sine/cosine output is 10 mA.

G.2 Serial Port Outputs

Serial ports #1 and #2 may be individually programmed to output any of the message formats described on the following pages. Up to four NMEA 0183 listening devices can be connected to each of the serial ports. Serial Port #1 also has a pass-through duplicate port.



Port 3 is not used if GyroTrac is connected to the TracVision antenna.

NMEA

The NMEA message format conforms to the NMEA 0183 version 2.20 standard for message structure.

KVH RS-422

The KVH message format is an RS-422 message format giving stabilized pitch, roll, and yaw data. Data output from Port 1 will be at 4800 baud while data from Ports 2 and 3 will be at 9600 baud; this message may be used in any device capable of receiving this data rate.

Cetrek Proprietary

The Cetrek proprietary message format is a stabilized heading output for use with Cetrek autopilots.

Each serial port can be independently programmed to output data at a rate of 1 Hz to 20 Hz, selectable in 1 Hz increments. The default data rate is 10 Hz.

Table G-1
*NMEA1 Magnetic
Heading Output*

NMEA1 Magnetic Heading (HDM)

Communication:	4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity	
Update rate:	Selectable at 1 to 20 Hz (10 Hz default)	
Sentence type:	\$HCHDM,XXX.X,M,* hh <cr> <lf>	
Sentence breakdown:	HCHDM	NMEA talker and sentence ID
	XXX.X	Stabilized magnetic heading in degrees and tenths
	M	Magnetic heading, ASCII hex 0x4D
	*	ASCII hex 0x2A
	hh	Checksum
	cr	Carriage return, ASCII hex 0x0D
	lf	Line feed, ASCII hex 0x0A

NMEA2 Magnetic Heading (HDG)

Communication:	4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity	
Update rate:	Selectable at 1 to 20 Hz (10 Hz default)	
Sentence type:	\$HCHDG,XXX.X, *hh <cr> <lf>	
Sentence breakdown:	HCHDG	NMEA talker and sentence ID
	XXX.X	Stabilized magnetic heading in degrees and tenths
	*	ASCII hex 0x2A
	hh	Checksum
	cr	Carriage return, ASCII hex 0x0D
	lf	Line feed, ASCII hex 0x0A

NMEA3 True Heading (HDT)

Communication:	4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity	
Update rate:	Selectable at 1 to 20 Hz (10 Hz default)	
Sentence type:	\$HCHDT,XXX.X,T *hh <cr> <lf>	
Sentence breakdown:	HCHDT	NMEA talker and sentence ID
	XXX.X	Stabilized true heading in degrees and tenths
	T	True heading, ASCII hex 0x54
	*	ASCII hex 0x2A
	hh	Checksum
	cr	Carriage return, ASCII hex 0x0D
	lf	Line feed, ASCII hex 0x0A

Table G-2

NMEA2 Magnetic Heading Output

Table G-3

NMEA3 True Heading Output



True Heading is only available when GPS data input is received by the ADCU. Refer to “Connecting GPS for True North Capability” on page 36 for complete details.

Table G-4
KVH Output

KVH Format Special Output Sentence (Set at Factory Only)

Communication:	9600 baud, 1 start bit, 8 data bits, 1 stop bit, no parity	
Update rate:	Selectable at 1 to 20 Hz (10 Hz default)	
Sentence type:	%AAAA,BBBB,CCCC <cr> <lf>	
Sentence breakdown:	%	Sentence identifier
	AAAA	Stabilized pitch attitude in tenths of degrees
	BBBB	Stabilized roll attitude in tenths of degrees
	CCCC	Stabilized magnetic azimuth in tenths of degrees
	cr	Carriage return, ASCII hex 0x0D
	lf	Line feed, ASCII hex 0x0A

Table G-5
Cetrek Output

Cetrek Output Sentence

Communication:	4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity	
Update rate:	Selectable at 1 to 20 Hz (10 Hz default)	
Sentence type:	\$\$MSB LSB B C Status D <cr> <lf>	
Sentence breakdown:	MSB LSB	Binary value 0 to 1023, equal to 0.0 to 359.6 degrees stabilized magnetic heading
	B	ASCII hex 0x00
	C	ASCII hex 0x00
	Status	ASCII hex 0x43
	D	ASCII hex 0xAA
	cr	Carriage return, ASCII hex 0x0D
	lf	Line feed, ASCII hex 0x0A

G.3 Furuno Output

The Furuno output is a proprietary message format typically used with Furuno and other brands of radars and autopilots. Two user-configurable options are available: true or magnetic heading and 25 millisecond (40 Hz) or 200 millisecond (5 Hz) data rate. The default rate is 200 millisecond/5 Hz.

Optional Stepper Components

An optional interface unit is available to generate a stepper output. The stepper interface uses an NMEA HDM or HDT serial message input to generate the stepper signal format. The stepper signal replaces traditional gyro outputs used with satellite communications systems, autopilots, and steering displays. The Stepper Interface unit is shown in Figure G-1 while the specifications are listed in Table G-6.

Please refer to the Stepper Interface User Manual for specific wiring instructions.

Stepper Interface

Dimensions	10.5" (267 mm) x 5.8" (147 mm) x 2.3" (58 mm)
Weight	13 oz (370 gm)
Input	NMEA 0183
Stepper Output	3, 6, 12, 24 steps/degree
Output Voltage	5 V standard (30-70 V option also available: Part Number 19-0089)

Stepper Voltage Converter

A stepper voltage converter (KVH Part Number 19-0089) is needed when the receiving stepper device uses a reference voltage greater than the 5 volt maximum available from the stepper interface. The converter is wired directly between the stepper interface output and the receiving equipment to provide the necessary reference voltage. An external 6-70 VDC power supply is required to provide the necessary voltage to this device. Figure G-2 on the following page shows the stepper voltage wiring connections and wiring diagram.

Figure G-1
Stepper Interface

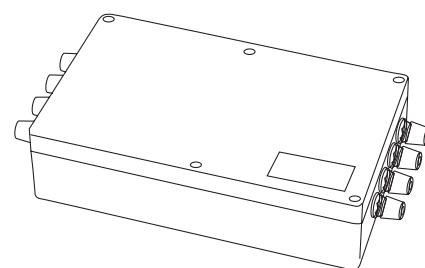
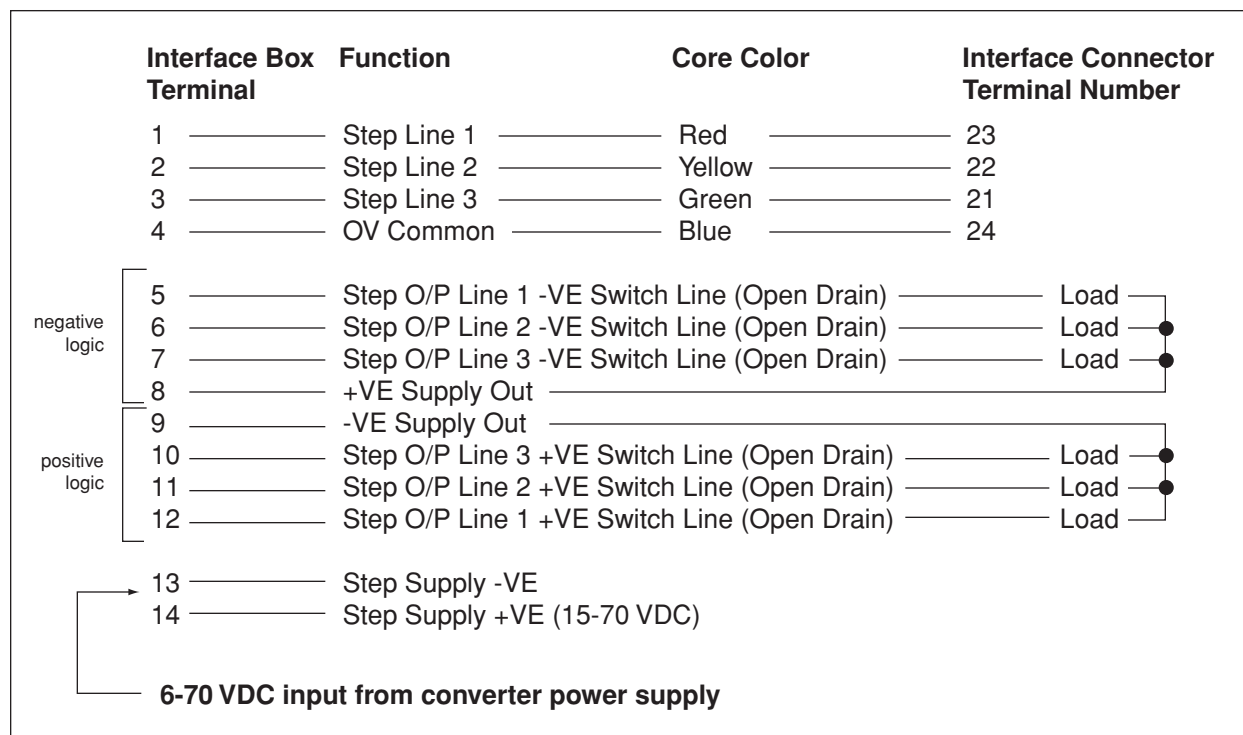


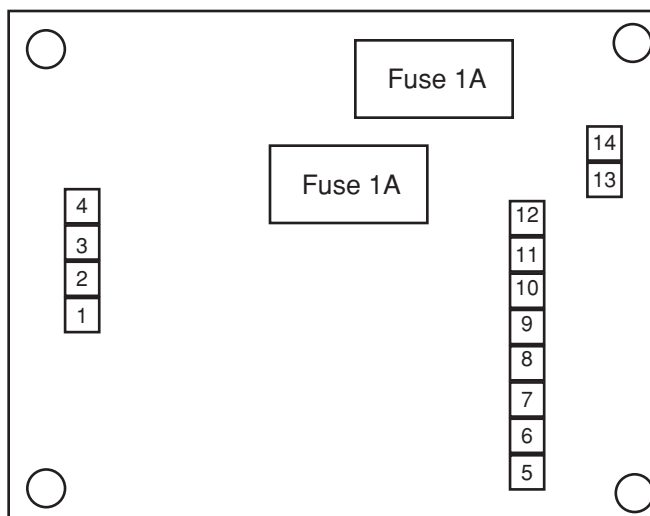
Table G-6
Stepper Interface Specifications

Figure G-2

Optional 6-70 V Stepper Voltage
Converter Wiring Diagram



The step supply is internally fused at 1 amp. Step output lines are opto-isolated from step input lines.



Appendix H

Maintenance Port Parser Commands

The TracVision G4 system parser commands are parsed when the system receives an ASCII carriage return (Hex 0D). An ASCII line feed (Hex 0A) is permitted but is ignored in any transmitted command. All system responses are terminated with an ASCII carriage return followed by a line feed and ending with either an acknowledge character (ASCII > (Hex 3E)) or a not-acknowledge character (ASCII ? (Hex 3F)). The parser commands are shown below in boldface capital letters but they are not case-sensitive. In most cases, the command is responded to with an echo; that is, if you type **ZAP**, for example, and press “ENTER” the response will be the command you have entered. For other commands, the response is specific for each command, such as **VERSION**, **STATUS** or **HELP**.

H.1 System Commands

Software Version

Function:	reports software version and system type
Command:	VERSION
Response:	KVH TracVision G4 Rev X - Version X.XX - XXX Motors

Table H-1

System Commands

System Status Report

Function:	reports general system status
Command:	STATUS
Response:	system status string

Initialize/Restart the System

Function:	initializes the system (performs a soft reset)
Command:	ZAP
Response:	echoes the command, then reinitializes the system

Help on Parser Commands

Function:	lists parser commands
Command:	HELP
Response:	lists all parser commands

Turn On Sleep Mode

Function:	turns on Sleep Mode
Command:	SLEEPON
Response:	echoes the command

Turn Off Sleep Mode

Function:	turns off Sleep Mode
Command:	SLEEPOFF
Response:	echoes the command

Turn On Instant On

Function:	turns on Instant On feature
Command:	INSTANTON
Response:	echoes the command

Turn Off Instant On

Function:	turns off Instant On feature
Command:	INSTANTOFF
Response:	echoes the command

Report Skew Angle

Function:	reports skew angle of the current satellite
Command:	SKEWANGLE
Response:	SKEW ANGLE = XXXX.X

Report Serial Number

Function:	reports system serial number
Command:	=SERNUM
Response:	SN = XXXXXXXXX

Enter Serial Number

Function:	enters system serial number
Command:	=SERNUM,XXXXXXXX
Where:	XXXXXXXX = the system's serial number
Response:	SN = XXXXXXXX

Configure System

Function:	configures software for a particular system model
Command:	=TVXXXX
Where:	XXXX = system model (i.e., G4HP)
Response:	system configures software and antenna restarts

H.2 Manual Positioning Commands

To execute the following commands, first put the antenna unit in idle mode by typing **HALT** and pressing "ENTER." Positioning commands may be entered after the antenna comes to rest.

Azimuth Angle

Function:	commands a manual azimuth angle that the mechanism moves to
Command:	AZ,XXXX (range is 0000-3599)
Argument:	desired azimuth angle of the mechanism relative to external magnetic reference, or baseplate fwd, 000°-359.9°
Response:	echoes the command; mechanism moves at a fixed velocity

Table H-2*Manual Positioning Commands***Elevation Angle**

Function:	commands a manual elevation angle that the mechanism moves to
Command:	EL,XXX (range is 100-850)
Argument:	desired elevation angle of the mechanism relative to up, or external sensor attitude reference, 10.0°-85.0°
Response:	echoes the command; mechanism moves at a fixed velocity

Azimuth CW Step

Function:	commands a manual 0.1° clockwise step in azimuth angle
Command:	6
Response:	echoes the command

Azimuth CCW Step

Function:	commands a manual 0.1° counter-clockwise step in azimuth angle
Command:	4
Response:	echoes the command

Elevation UP Step

Function:	commands a manual 0.1° UP step in elevation angle
Command:	8
Response:	echoes the command

Elevation DOWN Step

Function:	commands a manual 0.1° DOWN step in elevation angle
Command:	2
Response:	echoes the command

H.3 Operational Commands

Table H-3
Operational Commands

Tracking Mode

Function:	starts active tracking of the satellite
Command:	TRACK
Response:	echoes the command

Idle Mode

Function:	halts active tracking and conical scan, then enters Idle mode
Command:	HALT
Response:	echoes the command

H.4 Tracking and Conical Scan Commands

Target Location

Function:	reports the target location in antenna frame; data format is E### for elevation in degrees 000-900 and A#### for azimuth in degrees 0000-3599 with implied decimals
Command:	TGTLOCATION
Response:	Target Location = A = E###, A#### B = E###, A####

Table H-4

Tracking and Conical Scan Commands

Analog Signal Strength Report

Function:	reports signal strength from RF detector circuit in A/D counts (000-FFF Hex)
Command:	SIGLEVEL
Response:	Signal Strength = XXXX

H.5 Sensor Module Commands

Report Platform Attitude

Function:	reports vessel attitude indicated by sensor module
Command:	ATTITUDE
Response:	Pitch +/-PP.P, Roll +/-RR.R, Yaw YYY.Y

Table H-5

Sensor Module Commands

Compass Calibration Score

Function:	reports compass calibration score
Command:	CALSCORE
Response:	Cal Score = XXX

Compass Calibration Enable

Function:	enables the sensor module compass calibration
Command:	CALON
Response:	echoes the command

Compass Calibration Disable

Function:	disables the sensor module compass calibration
Command:	CALOFF
Response:	echoes the command

Compass Calibration

Function:	calibrates the sensor module
Command:	= CALGYRO
Response:	system initializes rate bias and calibrates the azimuth and elevation axis gyros

H.6 RF Board Commands

Table H-6
RF Board Commands

Serial Communications, Status/Polarization Report, Tone Changes

Function:	starts serial communications, reports status and polarization/tone changes
Command:	@S
Response:	S,s,p,b,m <cr> every 5 seconds until ><cr>is returned from system software
Where:	<p>s = satellite (A = primary, B = secondary)</p> <p>p = polarization (V = vertical, H = horizontal, R = right, L = left, X = no LNB power)</p> <p>b = band (H = high band, L = low band, U = USA)</p> <p>m = mode (V = valid, I = invalid)*</p>

* The Mode bit is used to evaluate the Satellite, Polarization and Band combination vs. the Frequency/Symbol Rate/FEC currently in RAM. This bit will be set to invalid if the Frequency for the selected combination is set to 0x0000; otherwise it will be set to valid. For example the Mode bit will be set to invalid when the frequency is set to 00000 to indicate that there is not a frequency to track for the LNB tone and voltage setting.

Report RF Tracking Parameters

Function:	reports all RF tracking parameters for primary & secondary satellites*
Command:	@SATCONFIG
Response:	F,x,ffff,S,C,ID,P,B,D <cr>
Where:	<p>x = satellite (A = primary, B = secondary)</p> <p>ffff = frequency in MHz (00000 and 10700 to 12700)</p> <p>S = symbol rate in Mbit/Sec (1000 to 29999)</p> <p>C = FEC code rate (valid rates = 12, 23, 34, 56, 67, 78)</p> <p>ID = satellite network ID in hexadecimal format (valid range = 0x0000 to 0xffff hex)</p> <p>P = LNB polarization (V = vertical, H = horizontal, R = right, L = left)</p> <p>B = LNB down conversion frequency (L = low, H = high, U = USA)</p> <p>D = decoding type (0 = test, 1 = DSS-A, 2 = DSS-B, 3 = DVB)</p>

* This command returns all eight combinations of the Satellite/Freq/Sym/FEC/ID/POL/Band/Decode currently stored in RAM.

Set RF Tracking Parameters

Function:	sets RF tracking parameter
Command:	@SATCONFIG,X,N,F,S,C,ID,P,B,D<cr>
Response:	Echoes the input data
Where:	<p>@SATCONFIG = directs data to the RF Board</p> <p>X = satellite location A or B</p> <p>N = satellite table # (98 & 99 are slots for user-configured satellites)</p> <p>F = frequency in MHz (either 00000 or a range from 10700 - 12700)</p> <p>S = satellite transponder symbol rate in Mbit/second (01000 - 29999)</p> <p>C = FEC code (e.g., 12, 23, 34, 56, 67, 78)</p> <p>ID = satellite network ID in hexadecimal format (0x####)</p> <p>P = LNB polarization (V = vertical, H = horizontal, R = right, L = left)</p> <p>B = LNB down conversion frequency (L = low, H = high, U = USA)</p> <p>D = decoding type (0 = test, 1 = DSS-A, 2 = DSS-B, 3 = DVB)</p>

Switch Satellites

Function:	shifts tracking to the second satellite
Command:	@L,A or B
Response:	echoes the command
Where:	<p>A = switches to Satellite A</p> <p>or</p> <p>B = switches to Satellite B</p>

ID Match/Decoded Network ID

Function:	reports ID match and decoded network ID
Command:	@CHECKID
Response:	<p>Y,0X####</p> <p>N,0X####</p> <p>Y,NoID</p> <p>N,NoID</p>
Where:	<p>Y = yes</p> <p>N = no</p> <p>0X#### = network ID</p> <p>NoID = satellite unidentified</p>

Frequency Scan

Function:	updates satellite frequency data
Command:	@SC,XXXXX,YY
Where:	XXXXX = symbol rate (010000 - 399999) YY = FEC code (e.g., 12, 23, 34, 56, 67, 78)
Response:	system automatically searches for the frequency with the strongest signal, then updates the satellite's programmed data with the new frequency (and associated network ID) and stores it in the satellite library

RF PCB Software Version

Function:	reports RF PCB software version
Command:	@VER
Response:	RF PCB Version X.X

Report Tracking Information

Function:	reports hardware/software locks, AGC value, bit error rate, and ADC value
Command:	@I
Response:	I,X,G,B,D,Y
Where:	X = hardware lock (0 = not locked, 1 = locked on satellite) G = AGC value (signal level) B = bit error rate D = ADC value Y = software lock (0 = not locked, 1 = locked on satellite)

H.7 Installation Commands

Table H-7
Installation Commands

Set/Report GPS Position

Function:	reports or sets default GPS position
Command:	GPS<cr> GPS,XX,D,YYY,E
Response:	GPS = XXD YYYY GPS: XXD YYYY
Where:	XX = latitude (0-90) D = S (South) or N (North) YYY = longitude (0-180) E = E (East) or W (West)

Report Satellite Names

Function:	reports names for satellites A and B
Command:	SATINSTALL
Response:	SATINSTALL,<sat_a_name>,<sat_b_name>

Report Tracked Satellite

Function:	reports name of satellite currently being tracked
Command:	SAT
Response:	SAT = <sat_name>

Report Configured Satellite Names

Function:	reports names for all configured satellites
Command:	SATLISTA
Response:	SATLISTA,<sat_name1>,...,<sat_nameX>

Report Valid Satellite B Selections

Function:	reports names for all valid Satellite B selections for a given Satellite A selection
Command:	SATLISTB,<sat_a_name>
Response:	SATLISTB,<sat_a_name>,<sat_b_name1> ...,<sat_b_nameX>

Install Satellite Pair

Function:	installs satellites A and B as the satellite pair
Command:	SATINSTALL,<sat_a_name>,<sat_b_name>
Response:	If valid pair, echoes the input data If invalid pair, returns error message

Configure Longitude of a User-configurable Satellite

Function:	configures one of the user-configurable satellites with the longitude provided
Command:	SATCONFIG,USERX,YYY,Z,D,L
Response:	If valid, echoes the input data If invalid, returns error message
Where:	X = 1 or 2 YYY = longitude (0-180) Z = E (East) or W (West) D = decoding type (0 = test, 1 = DSS-A, 2 = DSS-B, 3 = DVB) L = LNB polarization (C = circular, L = linear)

Set Saved Satellite Position

Function:	sets saved satellite position
Command:	GOTO,AZXXXX,ELYYY
Response:	SAVED SAT POS: AZ = XXXX, EL = YYY
Where:	XXXX = azimuth (0000 - 3599) YYY = elevation (100 - 850)

H.8 Debug Commands

Enter Debug Mode

Function:	enters Debug mode
Command:	DEBUGON
Response:	echoes the command, system enters Debug mode

Limit Switch Test

Function:	performs a limit switch test
Command:	=LSTEST
Response:	Limit Switch Status: PASS

Set/Report Offset Angles

Function:	reports or sets system offset angles
Command:	OFFSETS OFFSETS,XXXXX,YYYY
Response:	Offsets = XXXXX.X YYYYY.Y
Where:	X = azimuth offset (-1800 - 1800) Y = elevation offset (-450 - 450)

Table H-8
Debug Commands

Apply Default Values to Default Satellites

Function:	updates the default satellites to the default values
Command:	SATPAIR,X
Response:	displays numerous frequency commands and reports "Satellite Installation Complete"
Where:	X = 0 (satellites default to Astra1 & Hotbird) or X = 1 (satellites default to Expressvu and EchoStar 119) or X = 2 (satellites default to DSS_101 and DSS_119)

Report Last Satellite Tracked/Update Value

Function:	reports the last satellite tracked or updates the last tracked satellite to the value input if it is different from the current value
Command:	LASTSAT LASTSAT,X
Response:	Last = <sat_name>
Where:	X = A (updates to Satellite A) or X = B (updates to Satellite B)

KVH Industries Limited Warranty

TracVision G4

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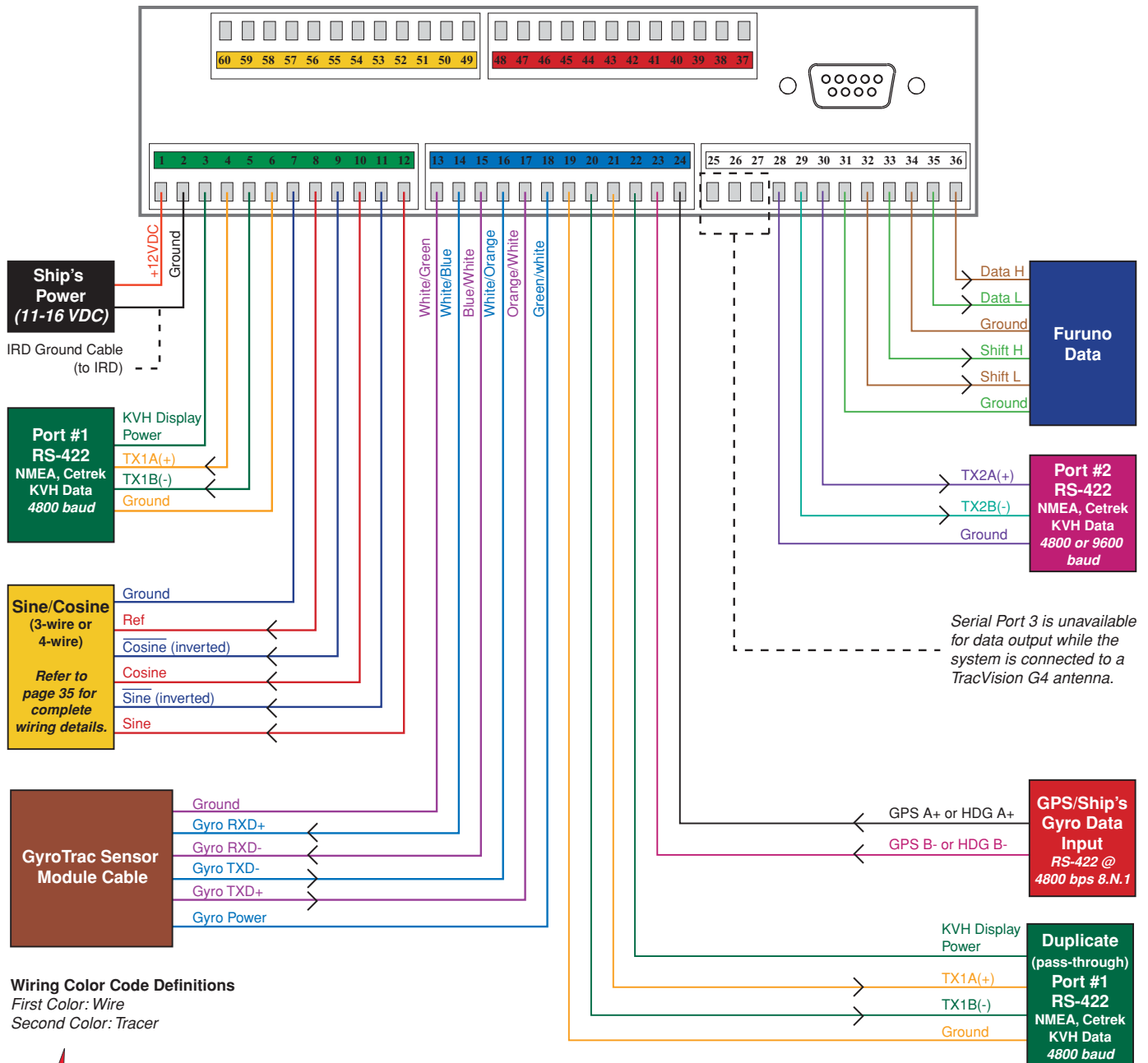
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GyroTrac Wiring Quick Reference Guide



A detailed wiring diagram and complete instructions have been provided in Section 2.6, "Wiring the ADCU."



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